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Engineered by Ignition Engineers**

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To accomplish this, Auto-Lite engineers developed new materials and greatly improved features. Konium, for example, is a new electrode superior in vital properties to anything heretofore available. Ziramic is a new insulator material developed and made by Auto-Lite. These features insure longer life and better ignition performance.

AUTO-LITE

"BALANCED IGNITION" PERFORMANCE

Auto-Lite Spark Plugs are built to work in perfect harmony with the rest of the Ignition System, and as a result, produce "Balanced Ignition"—more power in your motor—a spark of the right characteristic, delivered in the right place at the right time. Your motor will prove these facts to you as soon as you install a set of Auto-Lite Spark Plugs.

Merchandising Division

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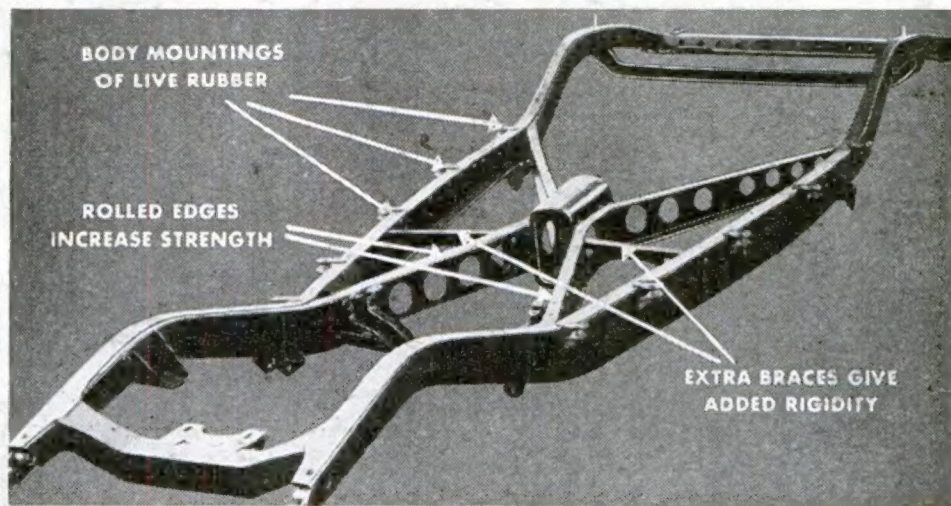
"SECRET OF LONG LIFE"

**EXTRA YEARS
SKILLFULLY ENGINEERED
INTO TODAY'S CARS**

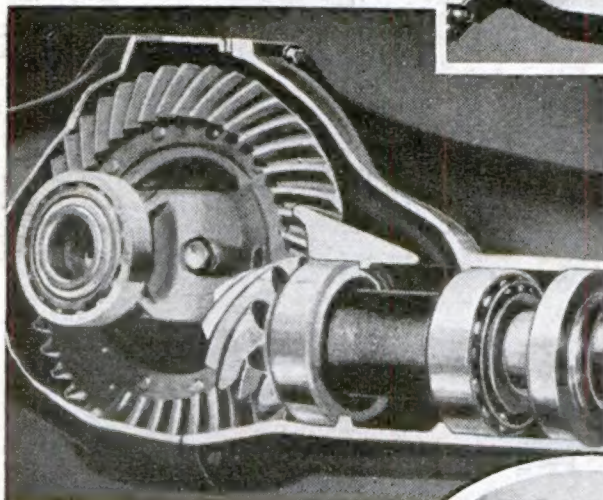
Things to Look for in Judging a Car's Stamina

HERE are some of Plymouth's engineering improvements. Others not pictured here, include Plymouth's *all-rustproofed* sheet metal...super-hard valve seat inserts...anodic-coated pistons.

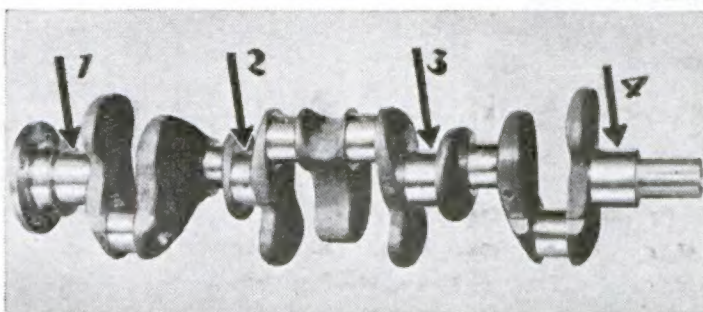
Check these things in your next car. They make Plymouth "the car that stands up best!"—PLYMOUTH DIVISION OF CHRYSLER CORPORATION, Detroit, Michigan.



GREATER STRENGTH and ruggedness in the big, rigid, X-type frame. New rubber body mountings absorb vibration...make the body quiet!



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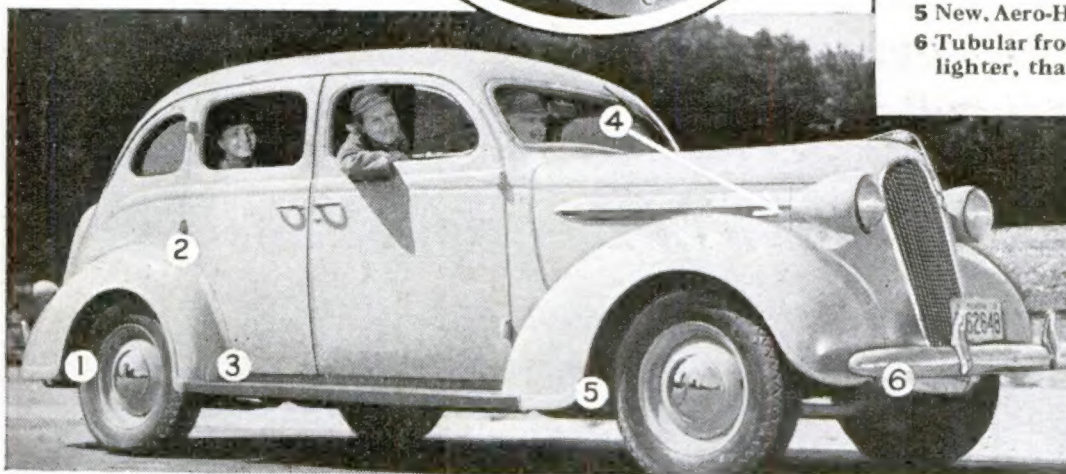
OTHER VITAL, LONG-LIFE AND ECONOMY FEATURES

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- 2 All-steel body...steel above, below, all around you...new quiet construction.
- 3 Semi-elliptic springs of special "Amola" steel.
- 4 Floating Power engine mountings dissipate vibration.
- 5 New, Aero-Hydraulic shock-absorbers.
- 6 Tubular front axle...stronger though lighter, than any other.

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Popular Mechanics Magazine

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

August, 1937

Vol. 68, No. 2

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Get That Picture!

WHEN you open your favorite newspaper, you find the news of the day told in pictures as well as type—pictures, perhaps, of a disaster only a few hours old or a great sports event 1,000 miles away. Daring news photographers made the photographs but making the pictures was only half the job. The other half was delivering the pictures to the paper. A few years ago graphic photographs of any except a local event trailed hours or even days behind the news story. Today the word story and the picture story both travel by wire and news pictures are handled as expeditiously as news articles. There's an interesting story in the development of processes for transmitting pictures by wire and you'll find it in September.

Next Month

AN eight-page Coloroto article in this issue describes the delights of living afloat in a modern cruising motorboat. Perhaps, after reading it, you'll observe, "That's all very well—but a yacht costs a lot of money." A yacht runs into money, but a little cruiser isn't a yacht. The second part of this article next month reveals just how little it costs to spend a vacation or an entire summer on the open water.

Hot News on the Air

WHEN big news breaks, radio reporters with portable transmitters whirl into action. And so fast do they move that your receiver often brings you eye-witness accounts of a tragic disaster or other big news event while the story is still in the making. There's plenty of excitement in the life of a radio reporter as you'll discover by reading about their experiences next month.

Liquid Gold

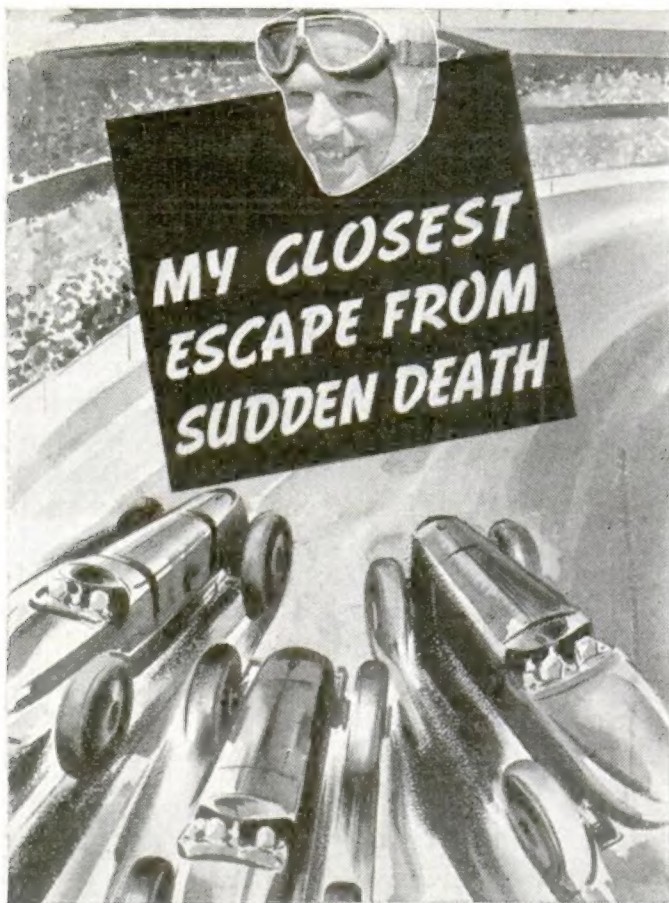
A FEW years ago gasoline, kerosene and lubricating oils were about the only products manufactured from petroleum. Today petroleum derivatives are numbered by the hundreds and range all the way from fly spray to T.N.T. and from lip sticks to golf-ball cores. An article next month discusses the new wealth being extracted from petroleum.

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This One



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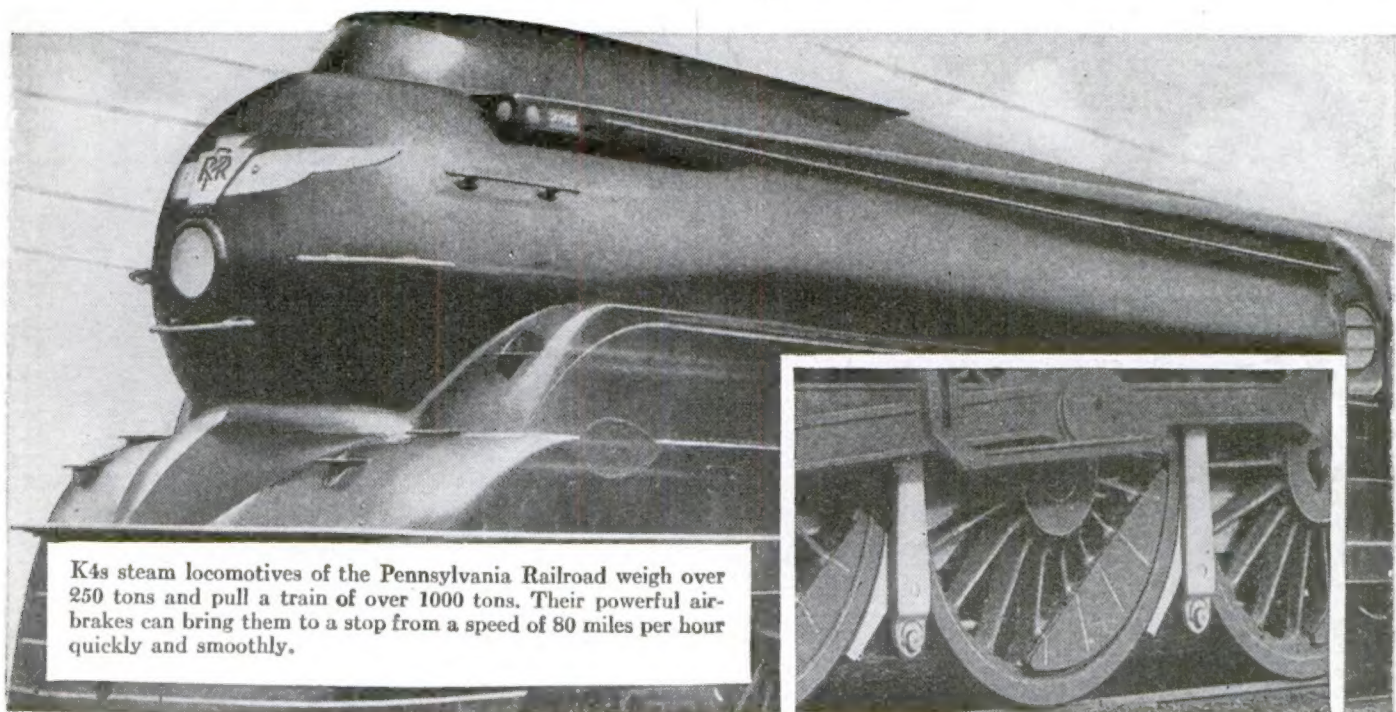
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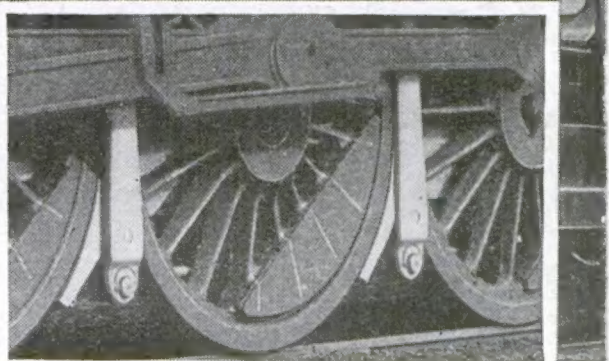
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80 MILES PER HOUR TO DEAD STOP IN A FEW SECONDS!



K4s steam locomotives of the Pennsylvania Railroad weigh over 250 tons and pull a train of over 1000 tons. Their powerful air-brakes can bring them to a stop from a speed of 80 miles per hour quickly and smoothly.



BRAKE SHOES are jammed against racing drivers by compressed air power for smooth, safe stops.

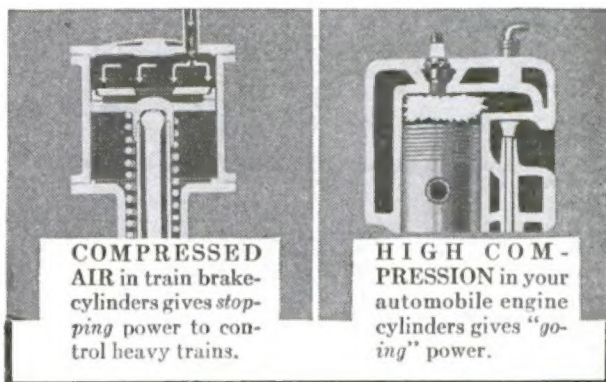
Powerful air-brake of locomotive illustrates **HIGH COMPRESSION** principle of modern auto engine

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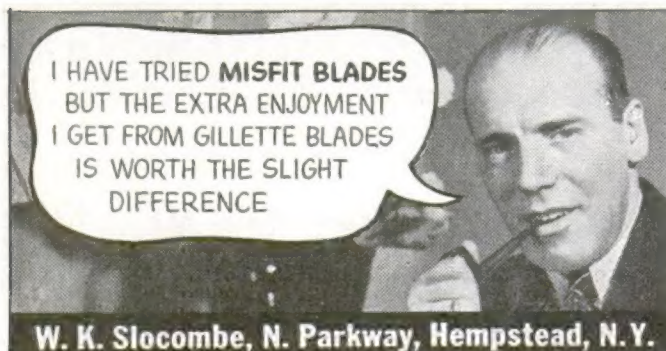
—says *Illinois man*

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in my Gillette Razor."



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Why Trained Accountants Command High Salaries

—and how ambitious men are qualifying by the La Salle Problem Method

GET this straight.

By "accountancy" we do not mean "bookkeeping." For accountancy begins where bookkeeping leaves off.

The skilled accountant takes the figures handed him by the bookkeeper, and *analyzes* and *interprets* them.

He knows how much the costs in the various departments should amount to, how they may be lowered.

He knows what profits should be expected from a given enterprise, how they may be increased.

He knows, in a given business, what per cent of one's working capital can safely be tied up in merchandise on hand, what per cent is safe and adequate for sales promotion. And these, by the way, are but two of *scores* of percentage-figures where-with he points the way to successful operation.

He knows the intricacies of government taxation.

He knows how to *survey* the transactions of a business over a given period; how to show in cold, hard figures the progress it has made and where it is going. He knows how to *use* these findings as a basis for constructive policies.

In short, the trained accountant is the *controlling engineer* of business—one man business cannot do without.

Small wonder that he commands a salary two to ten times as great as that of the bookkeeper. Indeed, as an independent operator (head of his own accounting firm) he may earn as much as the president of the big and influential bank in his community, or the operating manager of a great railroad.

Some Examples

Small wonder that accountancy offers the trained man such fine opportunities—opportunities well illustrated by the success of thousands of

LaSalle accountancy students.* For example—one man was a plumber, 32 years old, with only an eleventh grade education. Today he is auditor for a large bank and his income is 325 per cent larger.

Another was a drug clerk at \$30 a week. Now he heads his own very successful accounting firm with an income many times as large.

A woman bookkeeper—buried in details of a small job—is now auditor of an apartment hotel, and her salary mounted in proportion to her work.

A credit manager—earning \$200 a month—moved up quickly to \$3000, to \$5000, and then to a highly profitable accounting business of his own which nets him better than \$10,000 a year.

And What It Means to You

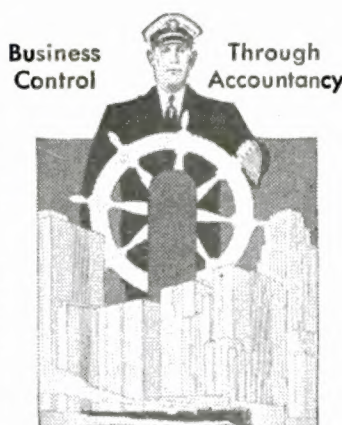
Why let the other fellow walk away with the better job, when right in your own home you can equip yourself for a splendid future in this profitable profession?

Are you really *determined* to get ahead? If so, you can start at once to acquire—by the LaSalle Problem Method—a thorough understanding of Higher Accountancy, master its fundamental principles, become expert in the practical application of those principles—this without losing an hour from work or a dollar of pay.

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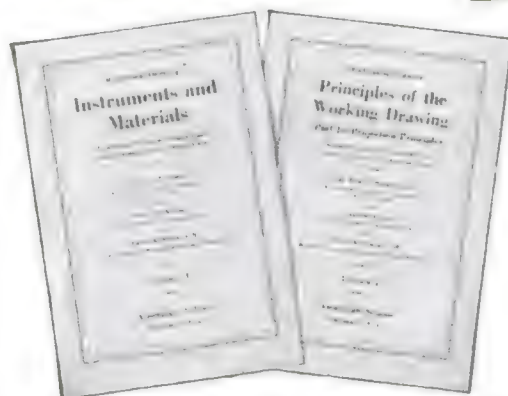
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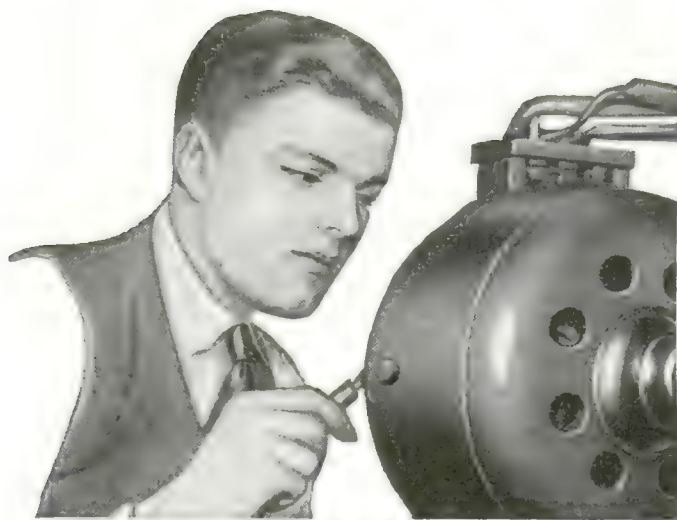
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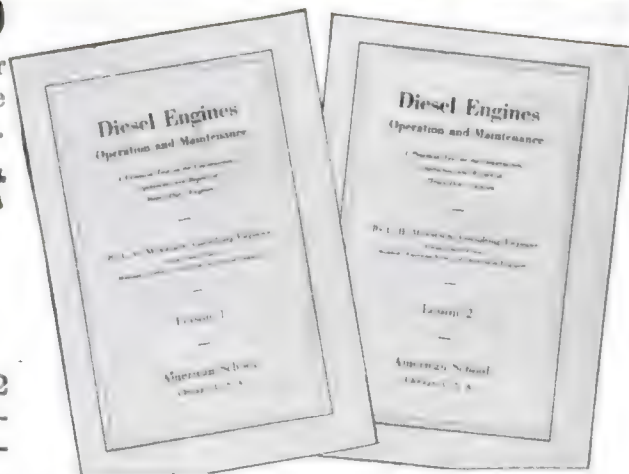
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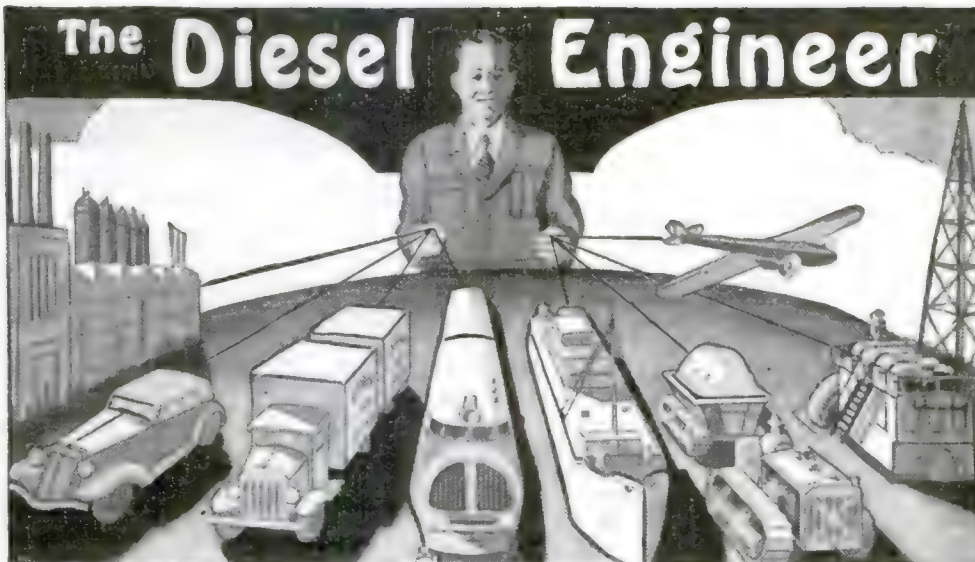
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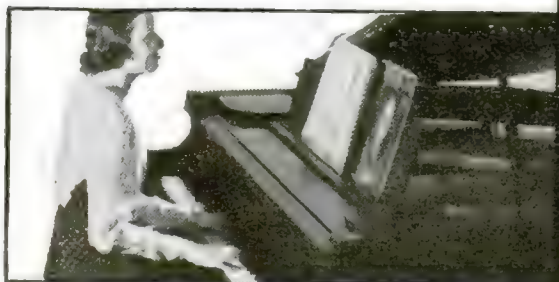
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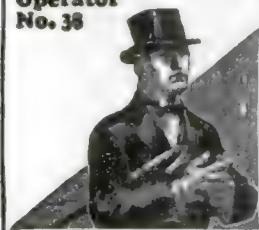
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Top row, coronation issues. Center, Czechoslovakian child welfare issue, George VI stamp, two triangular Liberian stamps, Nauru coronation and Pushkin memorial. Bottom, Polish pictorial, Greek issue, Ecuador's airmail, Mermoz memorial and Austrian Mother's Day stamp

ALTHOUGH Great Britain has the distinction of introducing the adhesive postage stamp she never has attempted to gain further honor, or dishonor among philatelists, by finding new reasons for special stamps. From 1840 to 1914 one set of stamps was sufficient for both postage and revenue. In the latter year she brought out her first postage due stamps, and ten years later, her first commemorative issue.

Other countries seem to be looking for excuses to issue new purpose stamps. The first of the special purpose stamps was the Newspaper stamp issued by Austria in 1851. Now there are at least twenty-five groups of these stamps, not including any of a fiscal nature such as Newspaper Tax, or War Tax stamps required on certain mail matter.

The Special Delivery stamps were first

used in the United States, having been introduced in 1885, but even today few countries have felt the need of this special-service stamp. Canada was second in 1898, and in 1899 and 1901, overprinted United States Special Delivery stamps were placed in use in Cuba and the Philippines respectively. The inscriptions on the stamps mentioned above are, of course, in the English language. When Cuba became self-governing she issued special delivery stamps with inscriptions in Spanish. This reads *Intrega Inmediata* and the same form appears on the stamps of Mexico and Panama, although some of the latter show the word *Expreso*, as do all of the special delivery stamps of Peru. The same form, or the inscription *Entrega Especial*, marks the stamps of the Dominican Republic. Va-

(Continued to page 22A)

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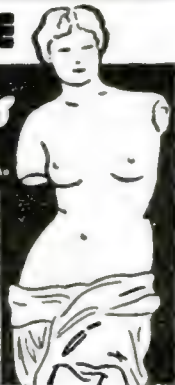
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(Continued from page 18A)

rious forms of the word express are used to denote the special service and in the case of New Zealand alone it appears in English as Express Delivery. Egypt uses Expres, Italy and colonies have one issue in that form but generally prefer Espresso, as do Fiume and Vatican City. Russia uses Expres and the Russian characters for special. In Brazil the word becomes Expresso. Spain uses the term Urgente or Urgencia and the Colombian Republic is similar with Correo Urgente Urbano. Mensajerias is the form used by Uruguay, Surgos, by Hungary, and Eilmarke by Bosnia. The special delivery stamps of China, Austria, Czechoslovakia and Eastern Silesia do not have inscriptions stating the purpose of the stamps.

Air Post special delivery stamps have been issued by Spain, Italy and Italian colonies, and by the United States, and Semi-Postal special delivery stamps by San Marino, Spain and some Italian colonies.

Another form of special delivery stamp which is limited to parcel post packages is the Special Handling stamp which the United States began to issue in 1925. The service contemplated by this stamp included quick dispatch from the office of origin as well as speedy delivery to the addressee.

The Too Late or Late Fee stamps may be classed as special delivery stamps of a peculiar nature. These represent an extra fee paid to the postoffice in order to have a letter placed on board a ship after the mails for that vessel have been sent aboard. Such stamps were issued by Victoria in 1855, by the Colombian Republic and states, between 1886 and 1903, and by Denmark in 1923. In the United States this service is handled under the head of supplementary mail without special stamps, but double the normal rate of postage must be paid.

New Stamp Issues

The stamps of Great Britain and colonies and dominions will hold the interest of collectors and dealers for the coming season. It is rather fortunate for collectors that the change in rulers took place when it did and not after the various sets of Ed-

(Continued to page 25A)

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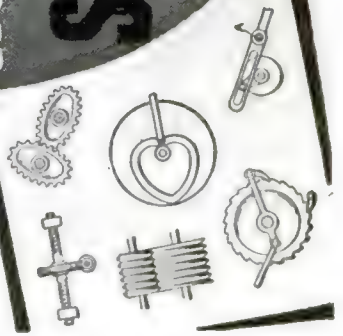
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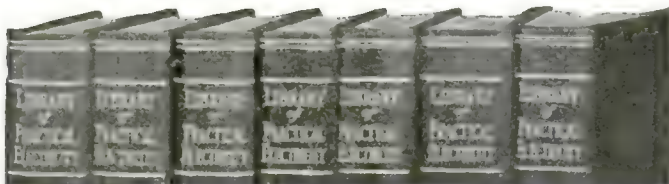
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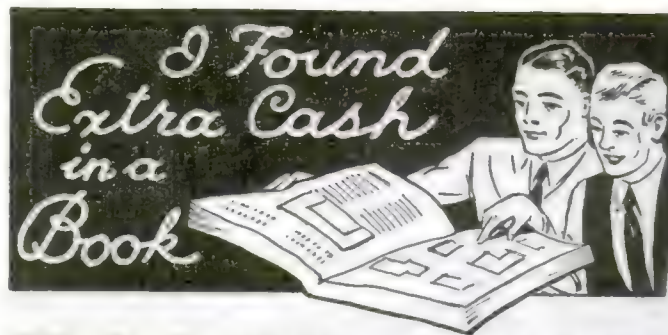
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(Continued from page 22A)

ward VIII stamps had been issued. The coronation stamps are only an appetizer, compared to what is to follow when the complete list of dominions, colonies and dependencies begin to issue definitive sets showing the portrait or attributes of George VI.

In the top row of this illustration are shown four examples of the coronation stamps. At the left is one value of a set of four bicolored stamps issued by the dominion of Southern Rhodesia, and next to it is the single value issued by Great Britain. Then follows a Newfoundland coronation stamp which is typical of the sets of three stamps issued by each of the forty-five colonies, and at the right is the single value issued by the dominion of Canada. Newfoundland has not forgotten the fact that she enjoyed dominion status for a long time, and has issued a set of eleven coronation stamps in addition to the colonial set of three. These eleven stamps combine designs used on previous issues with a portrait of George VI. Below these four and just left of the center is one value of three issued by Great Britain on May 10, as the forerunner of the new definitive set showing George VI, while at the right is one example of a set issued by the mandated province of Nauru to celebrate the coronation. The central pair of triangular stamps are a part of a new definitive issue of Liberia, of which six values were placed on sale April 10, 1937. The pair will show how triangular stamps are arranged in a sheet to avoid waste. At the extreme left of the middle row is a sample of the Czechoslovakian Child Welfare issue. The design shows a mother placing her babe in a cradle. At the right of the same row is one of the Russian stamps issued to commemorate the 100th anniversary of the death of the poet, Alexander Pushkin. Two values of the set were issued "se tenant," in a wide-margined souvenir sheet. Beginning at the left the bottom row shows one example of four new pictorial stamps issued by Poland. Next is the Greek stamp commemorating the centenary of the University of Athens. The design is based on an archaic statue of the goddess Athene, patron saint of Athens, and so of the University. In the center is an Ecuador air-mail stamp, one of a series issued in con-

(Continued to page 32A)

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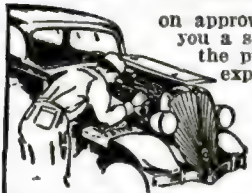
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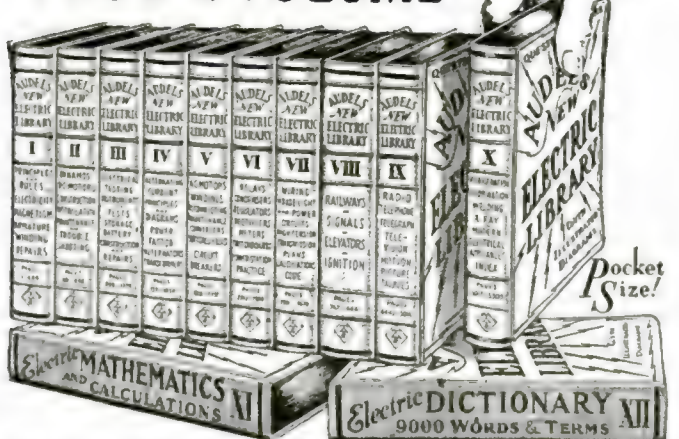
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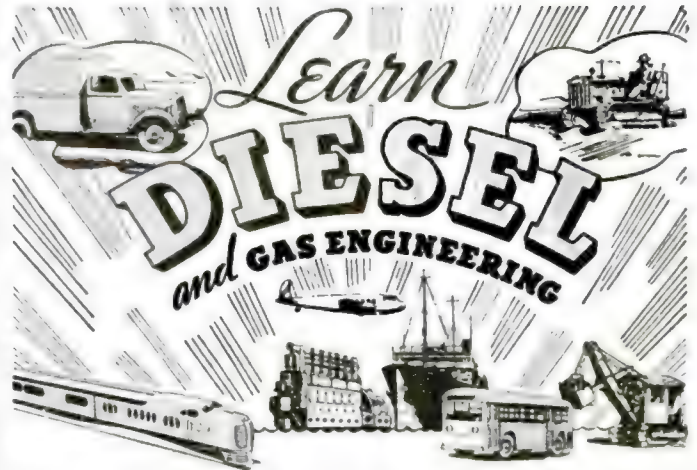
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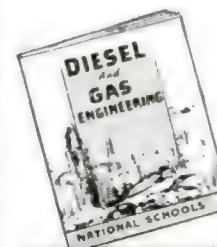
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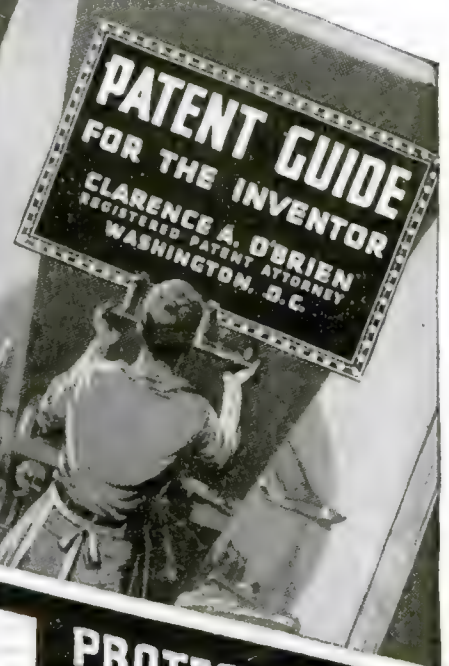
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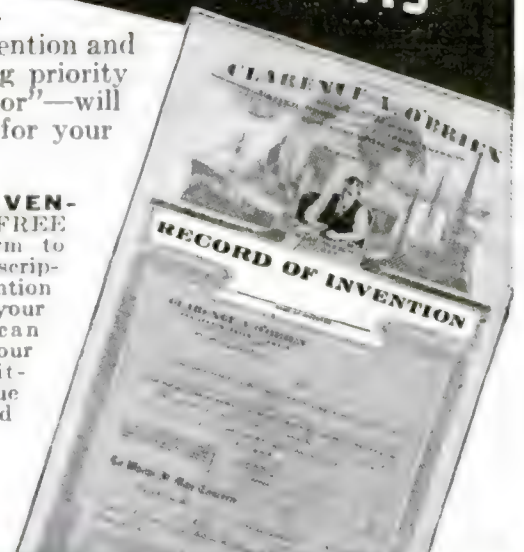
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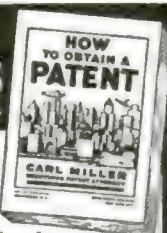
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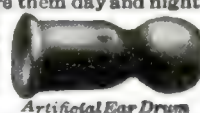
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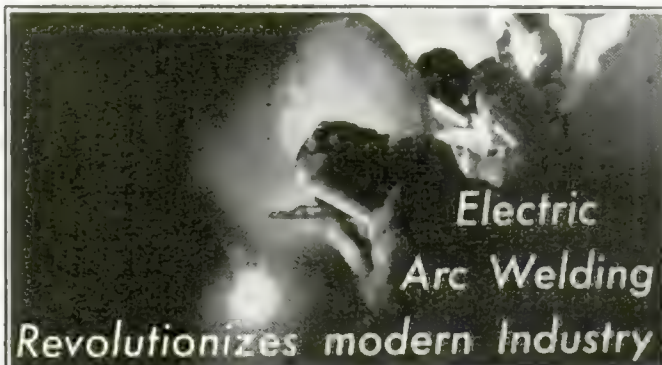


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(Continued from page 25A)

nection with the First International Philatelic exposition held at Quito, Ecuador. At the right is the 3fr value of a set of two stamps issued by France to honor the memory of Jean Mermoz, an airplane pilot who lost his life last year while in the South Atlantic service, and finally the new Austrian Mothers' Day stamp.

Stamp Notes

A new edition of the official booklet containing a description of all United States postage stamps issued from 1847 to Dec. 31, 1936, has been issued, and for the first time shows illustrations of the stamps. The booklet may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price is twenty-five cents for booklets with paper binding, or seventy-five cents for those with cloth binding.

—O—

Postmaster General James A. Farley has announced a new five-cent stamp to honor Virginia Dare, first child to be born to English parents in America. This stamp will be placed on sale on Aug. 18, 1937, the 350th anniversary of the event. It is believed this stamp will be used also for the souvenir sheet promised for the convention of the Society of Philatelic Americans, at Asheville, N. C., on August 26. Middle west collectors will be pleased to learn that a three-cent stamp to commemorate organization of the "Northwest Territory" has been approved for early issuance.

—O—

Complete information has been received on the Czechoslovakian triangular stamps shown in the July number of Popular Mechanics. One of these stamps is red and bears the letter "D" in each corner, the other is blue and has "V" similarly placed. These stamps are used on registered mail. The blue stamp is sold to the public and when affixed to a letter assures the sender that the letter will be delivered to the addressee only. When instructions are left at the post office for registered mail to be delivered to the addressee only, one of the red stamps is affixed to the letter and fifty haleru is collected on delivery. The letter "V" stands for Vyplatni (prepayment), while the "D" stands for Doplatni (postage due.)

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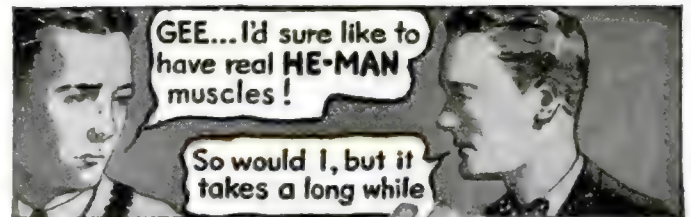
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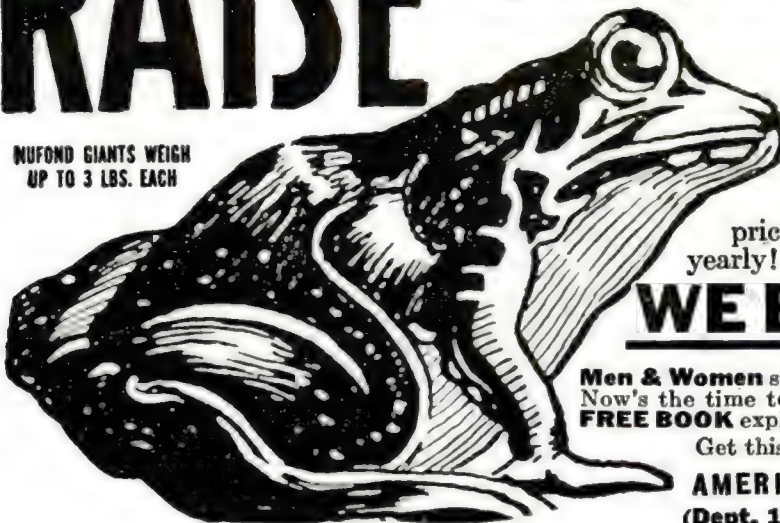
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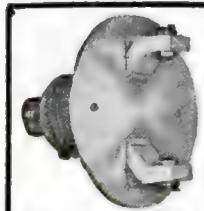
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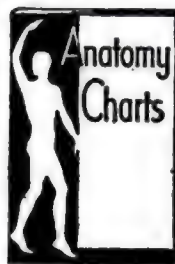
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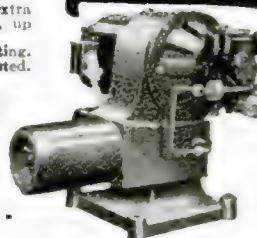
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10c BRINGS Copy National Mail Order News, Box 1773PM16, Roanoke, Virginia.

NEW Brush plating outfits for auto parts, reflectors, etc., connect to a battery, no tanks used. Almost as simple as painting. Good income plating and silvering mirrors, low cost. Free proof. Gunmetal Co., Ave. N, Decatur, Ill.

NEW Mailorder and local opportunities. Merchants Sales, 617M North Second, Milwaukee, Wis.

107 PLANS For making \$20-\$100 weekly in home or office business of your own. Descriptive booklet free. Elite Co., 214 Grand Street, New York.

FORMULAS, PLANS, ETC.

SELECTED Formulas. Cosmetics, insecticides, inks—anything. \$1 each. Gordon, 21601 Fenkell, Detroit, Mich.

GUARANTEED Formulas—New fast sellers. None better. Lowest prices. Catalog free. Kemico, 49H, Park Ridge, Ill.

MAKE Bleach water. Formula 50c. Capotosto, 1707 Cranston St., Cranston, R. I.

MONEY Making formulas 2c each. Send for list. Ben Buller, P. O. Box 211, Henderson, N. C.

1938 MONEYMAKERS. 25 Formulas 50c. Fay Smith, 319 Utica St., Waterloo, Ia.

ICELESS Ice! Colder! Cleaner! Cheaper! Instructions, 25c. Duffy, Covington, Ky.

ANALYSIS, Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

THREE Mirror formulas, \$10.00. Silver, gold, gunmetal. Write for information and samples. Nashville Mirror and Sign Co., 179 3rd Ave. N, Nashville, Tenn.

500 MONEYMAKING Formulas 25c. Descriptive literature free. Harvey Teeple, Decatur, Indiana.

SOILLESS Agriculture, raise tomatoes, potatoes, flowers, etc., in shallow tank of water containing 21 chemicals. Tomato vines 20 feet, bear for year, 20 pounds per vine, quality better than soil grown. Instructions, formula \$1.00. Purdy's Chemicals, 1852 E. Slauson Ave., Los Angeles.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

MOTOR Oil 2c per gallon. You can reclaim used oil, no machinery required. One cheap chemical used. Formula 25c. George, 285 E. Queen, Philadelphia, Pa.

NO More ice bills. Ice Ola keeps food cool. Formula 25c. George, 285 East Queen, Philadelphia, Pa.

CERTIFIED Formulas, best science can produce for making popular, biggest-selling specialties. All lines. Before buying formulas, get my valuable "Eye-Opening" literature, including free subscription to Miller's Monthly Messenger. Miller, Chemist, 1706-A, Tampa, Fla.

SUCCESS With your products. Make-sell them. Formulas, Processes, Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

FORMULAS—Latest money makers. Literature free. Belfort, 4042 N. Keeler, Chicago.

BOOKS Covering hundreds of subjects. Big catalog for 3c postage. Popular Mechanics Press, Room (C37), 200 E. Ontario St., Chicago.

CHEMISTRY

3 RESEARCH Experiments—25c. Keystone Laboratories, 149 Gladstone St., Philadelphia, Pa.

FREE Chemistry catalog. Supplies at 5c! Equip complete laboratory. Send 3c for postage and handling. Kemkit Scientific Corp., 397P Bridge Street, Brooklyn, New York.

ANALYSIS, Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CT-1142 Sunnyside, Chicago.

CHEMICAL Units for experimental chemistry. 40 assorted units in a durable aluminum cabinet for \$2.00. Send for list of contents. Fales Units, Inc., 72 Gold Street, New York City.

RUBBER Latex. Dime brings literature, twenty experiments. Eastern Latex Labs., Box 53, Canton, Mass.

CHEMICALS, Laboratory glassware, apparatus. Send 3c for catalog CP. Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, New York.

AGENTS WANTED

AGENTS Make 200% profit selling "Push." New product. Amazing possibilities. Sample, 25c. Details free. T. B. Gibbs Co., 207 B St. N. E., Washington, D. C.

CHRISTMAS Cards! Absolutely finest assortment. Big profits. Write for samples. Robinson Cards, 338 Orange, Clinton, Mass.

300% PROFIT In new perfected (1937) quick action self-starting cigar lighter. No flint or friction. What makes it light? No wind can blow it out. Retail 50c. Costs you \$2 a dozen. Sample and sales plan 25c. New Method Co., New Method Bldg., Box PM-56, Bradford, Pa.

GENUINE Remington portable typewriter for 10c a day! Men wanted to take orders for this remarkable bargain. M. N. Rand, Remington Rand, Inc., 315 Fourth Ave., Dept. H-50B, New York.

STRANGE Ironing cord and stand! Save electricity. Abolish scorching and lifting. Can't kink or snarl. For telephones also. Big free offer. Sales guaranteed. Samples furnished. Neverknot, Dept. S-A, 4525 Ravenswood, Chicago.

SENSATIONAL Summer seller. Sells for \$3.00 every home—you make \$2.00 each sale. Good for \$20.00 a day until September 27th. Send name quick for facts and free sample offer. L. B. Patterson, 510 Tenth St., Des Moines, Iowa.

CANVASSERS Buy household products cheaper. Your own literature. Latest deals. Paty Co., Dept. B, Somerville, Mass.

SELL Only (3) wool reversible Chenille rugs to get yours free. No limit to number you may sell. Sample 27x50 inch \$2.55, delivery paid 3 parcel post zone. Return in five days for any reason, money refunded. Extra large and odd sizes made to order, forty color selections. Write for full details. The Oriental Rug Company, Lima, Ohio.

PORTRAIT Agents including foreign countries. Lowest prices portraits, frames. Catalog free. Picture-Man Friedman, Dept. 9, 528 Cornelia, Chicago, Ill.

BIG Money. Fast sales. Your own business. Dunn, Box 74, Ionia, Michigan.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 12A.

AGENTS Make flavors, lotions, shampoos, medicines—68 products. Your name on labels, materials supplied. Quality Company, F-20030 Russell, Detroit, Michigan.

STARTLING Gas saving device, fastest selling automobile sensation. Splendid money-maker. Write now. Donnerg's, 820 N. Corinthian, Philadelphia, Pa.

YOU'LL Like resilvering mirrors, auto-parts, reflectors. Making chipped glass signs. Write. Sprinkle, Plater, 128, Marion, Ind.

TRANSPARENT Neon-like signs, 4c—retails 25c. Celluloid pricing sets, 50% commission. Sample free! Lowy, Department 726, 8 W. Broadway, N. Y.

LOCAL Agents wanted to wear and demonstrate free suits to friends. No canvassing. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. H. J. Graves, Pres., 1300 Harrison, Dept. W-817, Chicago.

NEW Soapless cleaning discovery! Amazing seller homes, everywhere. Sales guaranteed. Free sample. Chicago Products, D-3968 Avondale, Chicago.

450% PROFIT In perfected (1937) quick action automatic gas lighter. No flint or flame. Lights gas instantly. Retail 25c. Costs you \$1.00 for dozen or \$8 for 12 dozen postpaid. Sample 10c. New Method Co., Box PMG-56, Bradford, Pa.

EVERYONE Wearing glasses needs 25c item. Sample 10c. Box 107, Seward, Nebr.

BEST Seller of the year. Mercury Malls, Box 51, Ottumwa, Iowa.

IF You need money—Here's a genuine opportunity to make up to \$45.00 in a week. Operate grocery route business from your own home. I send everything; no money risk. Automobile given as bonus. Details free. Albert Mills, 2370 Monmouth, Cincinnati, Ohio.

DISTRIBUTORS—Welding tool. 300% profit. "Arrow," 4368-W Warren, Detroit.

NEW Items, universal appeal, steady income. Investigate. Orahood Sales, West Mansfield, Ohio.

CHRISTMAS Card bargains. Sell 50 personal Christmas cards for \$1. All beautiful folders with customer's name inscribed. Liberal commission. Free samples. Also marvelous value \$1.00 box assortments. General Card, 400 S. Peoria St., Dept. F-54, Chicago.

SELL 8x10 Hand colored photographic enlargements, simulated leather framed. Sells for \$1.25. 50c cash commission. Get free particulars for sample outfit. Economy Studios, Dept. 2908, 150 Nassau Street, New York.

MEN! Women! Luminettes—Electrified real wax candles with novel flame. Brand new. No competition. Instant seller to homes, stores and shops. Liberal commissions. Protected territories. P. J. Neuman, Room 1614, 9 Rockefeller Plaza, New York.

500% PROFIT! Gold reflecting letters for store windows. Large sizes 1c. Free samples. Modernistic Sign, B-3004 Lincoln Ave., Chicago.

SEVERAL Territories open for agent-distributors. Profitable, fast-selling line. Write Sevaco Products Co., 906 Main St., Cincinnati, Ohio.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

RE-NU Automobiles, woodwork like magic, samples. Other products, agents wanted. P. O. Box 768, Waco, Texas.

MAKE Extra money spare time showing my "Exclusive Selections" \$1 assortment 21 Christmas folders. You make 50c a box. Seven other Christmas bargains. Engraved holiday stationery, 50c. Gift wrappings. Write free samples. Schwer, Dept. 38, Westfield, Mass.

SENSATIONAL New zipper clothesline. Instant demonstration—sure sale. Free big money plan. Dunn Bros., Hempstead, N. Y.

\$5.00 HOURLY! Amazing electric saving invention. Free sample. Iron-So-Ezee, Mt. Washington, Ohio.

THYDRO-X (Extra miles). Fast seller! A money-maker! Up to 500% profit! Tremendous market! Year round seller! The bank account builder! Particulars free. Thermo-P Works, Peoria, Ill.

EARN Cash quick! Sell double value Christmas cards. Master creations personal cards, stationery. 7 different assortments, retail 60c up. Make up to 100%. Experience unnecessary. Samples free. Wallace Brown, 225 Fifth Ave., Dept. 110, New York.

ENORMOUS Profits selling Mexican feather pictures. Size 4x9", retails \$1.00, costs you \$2.64 dozen including duty. Free particulars. Sample 30c stamps. Marquez, Apartado 1176-P, Mexico City, Mexico.

JO BO Rubber bow ties. Excellent sideline. Jo Bo Products Co., 3402 School St., Des Moines, Iowa.

AGENTS, Sell metal Social Security plates. Send 10 cents for samples and details. G. W. Reese, 1218 English Avenue, Indianapolis, Ind.

STARTLING Invention—Liquid dispenser. Fast seller. Circulars free. Chandler, 6557 Yale, Chicago.

LEATHER Neckties—Big profits for salesmen. Look finer than silk. Cleaned with damp cloth. Always look new. All styles, colors. Sample tie and sales outfit 50c. Nu-Mode Ties, 1337-A North Twelfth, Milwaukee, Wis.

\$10.00 DAY And expenses easy, selling unique car washing device. Pocket sample. Sells by sight to service stations, fleet owners. No demonstration necessary. BB Chem. Co., Box 418, Gainesville, Tex.

BIG Money applying gold initials on automobiles. Easiest thing today. Free samples. Also, sideline salesmen for name plates and tire cover transfers. "Ralco," 1305 Washington, Boston, Mass.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

AGENTS: Smash go prices. Santos coffee 12c lb., 4-oz. vanilla 8½c. Razor blades 10 for 8½c. 100 sticks chewing gum 12c. Christmas cards, 21 in box, 14c. 150 other bargains. Premiums. Experience unnecessary. Carnation Co., PO, St. Louis, Mo.

90c PROFIT On \$1.00 sales. Cleaner for autos, metal and glass. Your name on labels. Free sample. Write. Instant Kleen Lab., Dept. E, Dayton, Ohio.

15,000 PROFIT Making formulas. Following and many others: Accidents and emergencies, agriculture, alloys and amalgams, artist's materials, beverages, cements, glues, pastes, mucillages, bleaching, renovating, coloring metals, dyeing glass, heat treatment of metals, household formulas, ice cream, confectionery, chewing gum, lapidary work, exterminating vermin, lubricants, paints, varnishes, photography, condiments, canning formulas, rubber, soap, candles, soldering, toilet preparations, perfumes, waterproofing, fireproofing, writing materials. \$5.50 postpaid. Popular Mechanics Press, Room (C37), 200 E. Ontario St., Chicago.

CHRISTMAS Cards—50 beautiful folders, name imprinted, cost 65c, sell for \$1.00. Marvelous 21-folder assortments sell for 60c and \$1, pay you 100% profit. Be first with this great new 1937 line! Extra bonuses for early sales. Samples free. Start now! New England Art Publishers, North Abington, 256, Mass.

SELL Novelty fun cards, novelties, etc. Samples 10c. National, Box 500M, Cincinnati.

NEW Brush plating outfits for auto parts, reflectors, etc., connect to a battery, no tanks used. Almost as simple as painting. Good income plating and silvering mirrors, low cost. Free proof. Gunmetal Co., Ave. H, Decatur, Ill.

MAKE More money taking orders: Shirts, ties, hosiery, raincoats, uniforms, dresses. Sales kit free! Experience unnecessary. Nimrod Company, Department S, 4922-28 Lincoln Avenue, Chicago.

GOLD Reflecting window sign letters. Penny each. Large sizes. Easily applied. New styles. Absolutely beautiful. Free samples. Atlas Sign Works, 7911 Halsted, Chicago, Ill.

BIG Money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50, make \$1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Company, Dept. 40, Dunellen, N. J.

SUCCEED With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

ENGRAVED Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

FREE Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

GENUINE Gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

AGENTS—Opportunity to make money; book containing 107 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

WANTED—District purchasing agents. No experience or money required. Write Purchasing Manager, 174 N. Halsted, Chicago.

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents" is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

PROFITABLE Home business. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

HIGH-GRADE SALESMEN

NEW Type repair section for saving tires. (Patents pending). Demonstrators months ago deliberately removed test sections, used repair, still using these tires. Furnished with superior solvent. Applied almost instantly, stays permanently. Higher and higher prices crude rubber and tires make this repair more valuable. Manufactured by reliable manufacturer. Wanted, distributors and dealers. Write Western States Mfg. Co., Sioux City, Iowa.

IMMEDIATE Openings for ambitious men! Wear, introduce "Fairbanks" tailored-to-measure clothes, make up to \$10 in a day. Experience unnecessary. Bonus suit offer. Low prices. Quick sales. Free outfit. Permanent! Fairbanks Company, 2305-A Wabasha, Chicago.

REMINGTON Rand will employ local representatives for portable typewriter division. No experience or investment. Unusual opportunity for reliable man. Write M. N. Rand, 315 Fourth Ave., Dept. H-50A, New York.

BOON To pedestrians. Lev-L-Lok, "The Locked Up Lock." Non-competitive. Eliminates projecting hazards on horizontal steel door closures, easily installed. Salesmen, distributors wanted. Lovatt & Radcliffe, 937 E. 26th Street, Paterson, New Jersey.

WANTED—Men for good paying work with a large shoe company. Good pay every day. Free shoes as bonuses to "go-getters." No experience needed. Complete sales outfit sent free. Write Consolidated Shoe System, Dept. G59, Chippewa Falls, Wis.

DON'T Be a job hunter. Start your own business on our capital. No hard times; no lay-offs; always your own boss. Hundreds average \$3,000 to \$5,000 annual sales year after year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary. Wonderful opportunity to own pleasant, dignified, profitable business backed by world wide industry. Write Rawleigh, Dept. H-U-PPM, Freeport, Ill.

BIG Commissions selling stores celluloid pricing tickets, metal shelf moulding, menu covers, signs, chrome changeable letters. P. Pricing Press, 124 White St., New York.

BIG Profits in your own business. Sell to stores by amazing new plan. Handle regular route. Place nationally advertised line 5c-10c counter display goods. 200 products, including Laymon's aspirin—tested, approved Good Housekeeping Bureau. Advertised in Saturday Evening Post. Merchants double profits. You make up to 112%. World's Products, Dept. 8810, Spencer, Ind.

EARN Big commissions daily; cash bonuses regularly. Sell genuine Trubenz Starchless-Collar Shirts guaranteed one full year. All season's newest styles. Ties, socks, underwear, also. Expensive new sample outfit free. Write today. Dept. P8, Quaker, Broadway at 31st Street, New York.

SPARKLING Glo-Brite signs sell fast to stores, restaurants, taverns. Lasting gold finish. Plenty profit. J. A. Baxter, Cambridge, Ohio.

NEW Punchboard assortments. Free large colored catalog. Nothing to carry. Larger cash commissions daily. Season now! Add-will Sales Co., 180 Adams, Chicago.

JUST Out! Directory of over 1500 large responsible business firms in every section of the United States who are immediately seeking direct selling salesmen. Full information about their products given. Also names of scores who supply you with complete outfits absolutely free—and pay generous commissions. Send 25c for this large 160 page book. It can be the means of making 1937 your greatest money-making year. Direct Selling Institute, Inc., 75 East Wacker Drive, Dept. B, Chicago, Ill.

I'LL Start you in the products business on my capital. 200 home necessities. Big profits. Quick repeats. Bargain deals. Write today. Ho-Ro-Co., 2745-R Dodier St., St. Louis, Mo.

SELL Nothing! \$95.00 weekly. \$500.000 punchboard firm announces new, no investment plan. Season starting. K&S, Dept. C128, 4329 Ravenswood, Chicago.

YOUR Own business! Become a subscription representative for "Popular Mechanics." No capital needed. Liberal commissions. Monthly bonus. Write for details. Circulation Department, 200 East Ontario Street, Room 401, Chicago.

SALESMEN, Sell world's best Diesel engineering instruction books. Free particulars. Nanesh Mailings, Box 147, Racine, Wis.

GOOD Opportunity in desirable territories to distribute increasingly popular Grafo Products to automotive and industrial trades. Excellent commissions. Write today for information on your territory. Grafo Lubricants Corporation, 6 Grafo Building, Sharon, Pennsylvania.

INVENTION Sharpens scissors. Reliable salesmen needed. Trial offer. Sample 25c. Shear-Sharp, 3413 Clarendon, Cleveland, Ohio.

SALESMEN, Contacting taverns, confectioneries, etc. Send for our new novelty, premium and salesboard wholesale catalog listing thousands of new items at remarkably low prices. Real opportunity for live wires. Write today. Badger Novelty Co., 2546 North 30th Street, Milwaukee, Wis.

FREE Suits, o'coats, pants. Given as bonus besides large cash profits premiums and gifts. Sell only (4) suits to get a free suit. No limit to number of free garments you may earn. Wholesale prices \$17.99-\$21.99-\$24.99. Sample line free. No experience needed to make big money. All garments individually cut and tailored to measure. Satisfaction or money back guarantee. Square Deal Tailoring Co., Inc., 332 South Franklin St., Dept. L-1, Chicago, Ill.

\$10.00 DAY And expenses easy, selling unique car washing device. Pocket sample. Sells by sight to service stations, fleet owners. No demonstration necessary. BB Chem. Co., Box 418, Gainesville, Tex.

SALESMEN: Sell complete line Hammer-mill bond business stationery, book matches, advertising pencils, shelf-moulding, tear-off business cards, labels, salesbooks, garage forms, etc. Free deals, premiums, 35% comm. daily. Free sales portfolio. Willens, 2130 Gladys, Dept. TL, Chicago.

ADVERTISING Book match factory offers you amazing opportunity. We are largest in world selling direct. Big cash commissions, bonuses. Full-part time. Big repeats. Samples and kit free. Dept. E-8, Match Corp. of America, 6041 Grand, Chicago.

MAIL Selling at home, experience unnecessary. We guarantee no canvassing, peddling. Sample, particulars 25c. Sheal, Box 263, Duluth, Minn.

SALESMEN—Distributors for fast selling supplies to welders, auto repair shops, auto body shops. Hercules Products, 325 Roebing Street, Brooklyn, New York.

EARN Free suits as bonus and big profits. Do you know a dozen or two men to whom you can sell fine, made-to-measure suits if you show them big savings? Make easy money. Get own clothes free as a bonus. No experience needed. Work spare time. Prices \$15.95 up. Amazing values. Newest styles—fabrics. Every garment guaranteed. Beautiful outfit sent free. Jim Foster, Inc., 2252-A So. Spaulding Avenue, Chicago, Illinois.

SELL To stores. Excellent proposition. Atigo Co., St. Johnsville, N. Y.

SALESMEN. Distributors, new deal—more profit. Exclusive territory. 125 varieties brushes, mops, specialties. Neway Brush Co., Hartford, Conn.

NEW Burglar proof lock. Fast seller. Salesmen, distributors wanted. Stewart Safety Window Lock, St. Clair Shores, Mich.

MAKE More money taking orders: Shirts, ties, hosiery, raincoats, uniforms, dresses. Sales kit free! Experience unnecessary. Linrod Company, Department 65, 4922-28 Lincoln Avenue, Chicago.

SALESMEN—Four \$15 sales to stores net you \$40 daily. Sayers Systems, Est. 1895, 2801-123 Sheffield Ave., Chicago, Ill.

SALESMEN: Sell advertising novelties, calendars, fans, thermometers, etc., for nationally known firm. Liberal commissions. Stanwood Hillson Corp., 21 Station St., Brookline, Mass.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Ferrell cleared over \$1,000.00 monthly. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

BE Your own boss. Make the largest commissions selling our complete line of brushes. Write for sales plan. Wire Grip Sanitary Brush Corp., 220 Southern Boulevard, N. Y.

BRUSH Salesman—If you ever sold brushes write for our money making proposition. Donald Brush Co., Camden, New Jersey.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

SALESMEN—Sideline free pocket samples patent punchless checks and guest checks. Sells to hotels, restaurants and soda fountains. Commission on reorders. Standard Check & Menu Co., 348 N. Ashland Ave., Chicago, Ill.

MECHANIC Salesman wanted. Sell new patented inexpensive electrical trouble shooter. Every repairman buys on demonstration. Qualified men making \$75.00 weekly. 2812 Gillham, Kansas City, Mo.

HELP WANTED

IF You want to get groceries at wholesale and make up to \$45 in a week besides, send me your name immediately. No experience necessary. New Ford sedan given you as bonus. Albert Mills, 2364 Monmouth, Cincinnati, Ohio.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 12A.

STEADY Income. Home work. Experience unnecessary. Jankus, Box 163, Kenosha, Wis.

UNEMPLOYED? Desire a better job, perhaps? We can help you. Write Keith Service, Ogallala, Nebraska.

EDUCATIONAL AND INSTRUCTION

BUMPING. Welding, metal finishing, soldering, taught. Men getting jobs. Factory Trade School, 8807 Harper, Detroit, Mich.

ENGINEERING Drawing pays big. Pleasant work. Easy home study course. Free tools. Write, Morris Dunn, Ionia, Michigan.

WATCHMAKING. Lessons, practice movement \$1.00. Catalogue 5c. Tools, material. Stewart's, 721 Olive, St. Louis, Mo.

WORK For "Uncle Sam." Start \$1260-\$2100 year. Try next held examinations. List positions and particulars telling how to get them—free. Write today. Franklin Institute, Dept. F3, Rochester, N. Y.

BECOME Business Investigator—Make money in your spare time—pleasant work—good fees. Details free. Business Detective System, 1009 Oak, Elmira, N. Y.

BECOME An investigator—Secret service agent. New "Test Problem Method." Develops your ability. Particulars free. International Secret Service Institute, (PM87), Hoboken, N. J.

LEARN Massage, physiotherapy—Free literature. Dr. Crandall's Institute, York, Penna.

MAKE More money. Get a U. S. government job. Get our new plan for obtaining one—no obligations. Age 18-50. Write. Instruction Service, 101, St. Louis, Mo. Immediately.

SECRET Investigations. Excellent opportunity. Particulars free. Write George Wagner, M-2640 Broadway, New York.

COLLEGE Courses at home. Degrees—Psychology, engineering, law, many others. Free bulletin. Temple Bar College, Missoula, Montana.

LEARN Lettering \$1 complete course. Northeastern School of Lettering, Bangor, Maine.

DOUBLE Entry bookkeeping mastered 60 hours with keys. (Diplomas.) International Bookkeeping Institute, 8, Springfield, Mo.

PHOTO-COLOR—Learn at home—Easy method. Make money. Complete course only \$1.00. W. Greener, St. Johns, Michigan.

LEARN About Alaska! Thrilling, illustrated stories, articles on game, mining, industries. Send 15c single copy; \$1.50 year. The Alaska Sportsman, Box C-142, Ketchikan, Alaska.

BIG Bargain catalogue educational matter 10c. Handling, Y-799 Broadway, New York.

BLUE-PRINT Reading taught by mail. Write Blueprint Reading Institute, Box 5662, Metropolitan Sta., Los Angeles.

AMBITIOUS. Alert men trained to qualify as insurance claim adjusters—Complete courses resident school and homestudy by the author of the outstanding publications on claims in the nation. Enrollment limited to placement possibilities. Act now. American Adjusters Institute, Des Moines, Iowa.

HOMESTUDY. Trimester doctor course. Earn while learning. Collegium, S-Whitely, Ind.

HOME Study engineering courses leading to degrees. Mechanical; electrical; Diesel; civil; aeronautical; automotive; chemical; radio and others. McKinley College of Engineering, Chicago.

GET \$50 To \$87.50 every pay day on Uncle Sam's payroll. Many appointments expected soon. Our coaching helps qualify you for Social Security, liquor gauger, meat inspector, office clerk, stenographer, typist, customs, postal and many other positions. Write today for free book, list of positions, etc. Patterson School, (Arthur R. Patterson, former Government examiner, Principal), 8 Case Bldg., Rochester, N. Y.

MASSAGE. Hydrotherapy, dietetics, drugless therapeutics, chiropody, taught by mail. Evans Correspondence School, Montgomery, Ala.

LEARN Machinist trade, tool, die making. Automatic and hand screw machines. Modern shop methods. Actual work. Jobs open for trained men. Employment help. Illustrated booklet free. Allied Screw Machine Company, 601 Lake Street, Chicago.

LEARN Auto mechanics, body, repairing, welding, electricity, refrigeration, Diesel. Stevinson's, 2008A Main, Kansas City, Mo.

LEARN Latest methods solving arithmetical problems quickly. Frederick A. Smith, 2410 Smalley Court, Chicago.

OFFICIAL Refrigeration Service Manual. Electric. Gas. Be a service expert. Every refrigerator part explained. Diagrams shown. 400 pages. Loose leaf. Leatherette binding. \$5.00 postpaid. Popular Mechanics Press, Room (C37), 200 E. Ontario St., Chicago.

PLAYS—STORIES—MANUSCRIPTS

SCREEN Writers—Movie plot digest supplies story ideas. Sample 25c (coin). Friedman, 1146 Ogden, New York.

STORIES Wanted to sell on commission. Unusual sales plan. Crown Service, 917 Shreve Bldg., San Francisco, California.

WANTED—Unusual manuscripts for publication. Fortuny's Publishers, 45 West 45, New York.

CARTOONING AND COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

SIGN Painting letter patterns ready to use for quick layout. Illustrations postpaid. Headquarters for home-study showcard lettering instruction. Thompson School, 872-3, Pontiac, Michigan.

COMPLETE Cartooning course consisting of spiral bound book of lessons, drawing board, Tee-square, triangles, pens, pencils, India ink, brushes, eraser, tacks, pencil pointer, tracing paper and drawing paper. \$2.00 prepaid anywhere. Cash, check, money order or stamps. Cardinell, Montclair, N. J.

SILK Screen process. See our ad under Printing Outfits. Artset Company.

AMATEUR Cartoonists—Win \$25.00. No drawing ability necessary to win. 26 prizes in all. Rush name on postcard for valuable tips on "How to Make Money With Simple Cartoons," cash prize entry blank and rules. Send no money. Cartoonists' Exchange, Dept. C-98-A, Pleasant Hill, Ohio.

CARTOONING. Sketching, etc., by Alexander Murray, 46 lessons, 600 illustrations, including practice sheets, pens, pencils, drawings criticized. \$1.00 complete. Singer Service, 1782 E. 100th, Cleveland, Ohio.

CARTOONING. Sketching, etc., by Alexander Murray, 46 lessons, 600 illustrations, including practice sheets. Special price: 50c. Fraba Service, Cashton, Wisconsin.

DRAWING Course by Alexander Murray 50 cents. Ancasco, Box 271, Rochester, New York.

CARTOONING Course: Thirty illustrated lessons, over 500 drawings, pens and pencils, \$1.00 complete, postpaid. Scovell Studios, Box 748-P, Hollywood, Calif.

AMATEUR Cartoonists, earn up to \$35.00 weekly, copying cartoons for advertisers. 3-M Service, Argyle, Wisconsin.

ADVERTISING AGENCIES—FOR ADVERTISERS

LEARN Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 3431, Chicago.

ADVERTISE. Sell by mail. Booklet free. Goodall, 742 Market, San Francisco.

WEATHER Forecasters. Excellent advertisers or premiums. Six, 25 cents; hundred, \$2.75. Lorraine, 307 Pearl Street, New York.

MATCHES—2,500 Books \$8.95. Quick cash sales. Rush printing instructions. Sanderson's Book Matches, Ottawa, Illinois.

ADVERTISE: 5 Lines 100 national mail order publications \$4.00. Lists free. Advertising Bureau, 4515-C Cottage Grove, Chicago.

INCH Display advertisement 30 magazines year \$24. Wood's Popular Services, Atlantic City, (N. J.)

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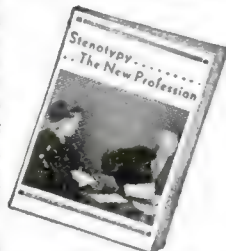
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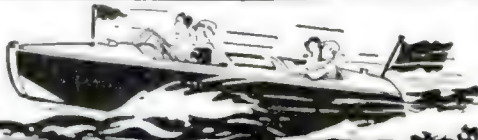
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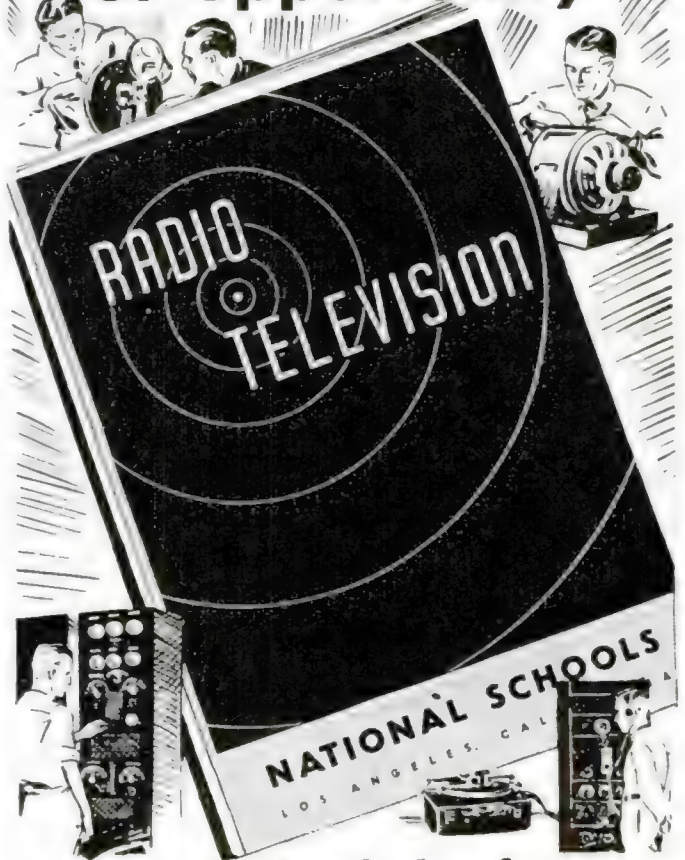
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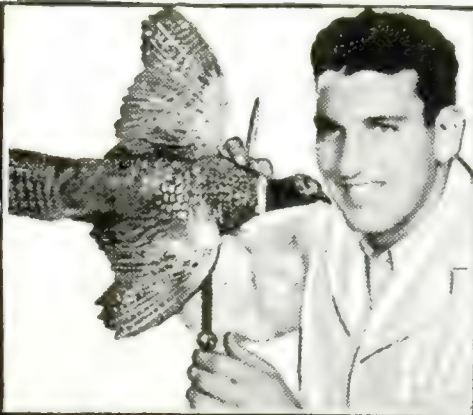
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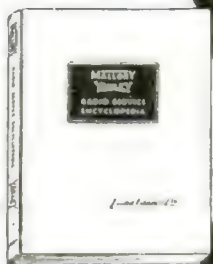
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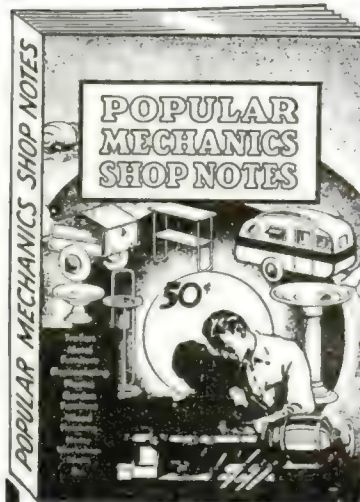
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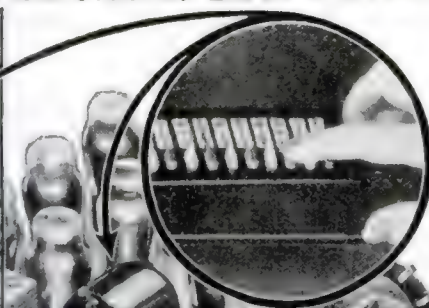
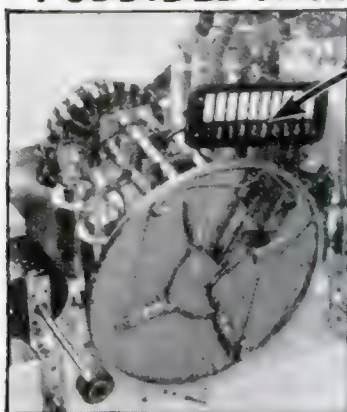
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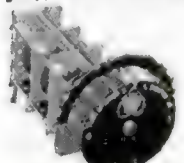


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Now, Midwest gives you today's finest world-wide overseas reception. Note that the dial on the chassis shows only the broadcast band. Then, flip 6-wave-band-switch, and, instantly, 5 additional bands are projected on the dial.



MAGIC MYSTIC BRAIN

"Mystic Brain" interprets your touch button signals and controls electric motor. Ten contact fingers can be easily set to any ten stations you desire.

A VITAL engineering advancement, Midwest's Electric Touch-Button Tuning is entirely automatic and the sensation of the radio world! Ten touch buttons completely control the set. Touching any button turns set "on" and tunes in desired station. Nine other favorite stations are automatically and perfectly brought in... Zip... Zip... Zip... as fast as you can touch buttons. No more dial twiddling!

Why be content with an ordinary 10, 12 or 14-tube set, when you can buy a 20-tube Super DeLuxe Motorized Midwest for the same money. It will surprise and delight you with its brilliant world-wide reception on 6 bands. You save 50%—and get 30 days free trial in your own home—when you buy direct from the factory at wholesale prices. You are triply protected with Foreign Reception Guarantee, One-Year Warranty and Money-Back Guarantees.

TERMS AS LOW AS \$1.00 A WEEK

You have a whole year to pay for your Midwest on the easiest and most convenient of credit terms. Send for the FREE 40-page catalog today—and begin to enjoy motorized radio at its best, right now!

Send for FREE 40-PAGE CATALOG!

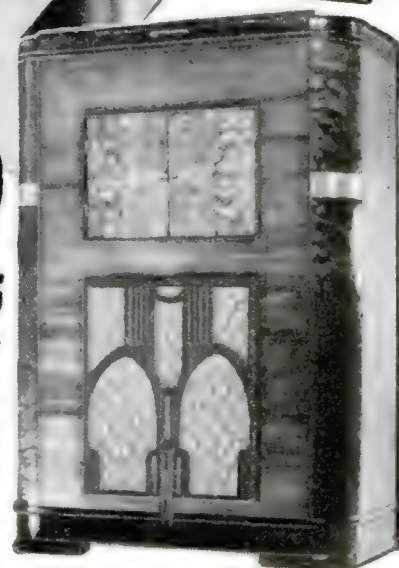
See for yourself that Midwest offers today's greatest radio values! Write for new 1938 Factory-To-You Catalog showing 40 pages of radios, chassis and features—in their natural colors. Select the one you like on 30 days FREE TRIAL in your own home.

Service Men! Join nation-wide Midwest service organization. Write for free details.

only
\$49⁹⁵

FACTORY-TO-YOU
NEW LOW BASE
PRICE CHASSIS

The new 1938 Midwest consoles are triumphs of the furniture art. The Trio-Sonic Reproducers (3 speakers), installed in this 20-tube console were especially developed for use with Double Power Beam Output Tubes.



30 DAYS
FREE
TRIAL

PASTE COUPON ON 1¢ POSTCARD...OR WRITE TODAY.

MIDWEST RADIO
CORPORATION

Dept. AA-15 Cincinnati, O.

Send me your

new FREE cata-

log and complete

details of your

liberal 30-day

Free trial offer.

Special offer and prices

prevail only when

dealing direct with

factory by mail.

Name.....

Address.....

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User-Agents Make Easy Extra Money. Check Here ☐ for details.

MIDWEST RADIO CORP.

DEPT. AA-15

CINCINNATI, OHIO, U.S.A.

Established 1920

Cable Address MIRACO...All Codes

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SEALED POWER PISTON RINGS

Best in New Cars! Best in Old Cars!

LIGHTNING-FAST get-away . . . robust speed and power . . . thrifty on oil . . . stingy on gas! That's the 1937 Nash LaFayette-"400".

Under its hood, of course, you'll find Sealed Power Piston Rings—put there after engineers' tests had proved they mean greater speed, greater power, and maximum oil economy. Just like the engineers of Buick, Cord, Hudson, Oldsmobile, Pontiac and other splendid 1937 cars—Nash engineers know Sealed Power Rings are designed right! That they *seal* power!

New Ring for Old Cars

Now, Sealed Power offers a special expander ring for cars that have gone 10,000, 20,000, 30,000 miles or more. The experience of hundreds of thousands of motorists proves that this great new-type ring ends "between meal oil hunger." Without excess pressure

an inner spring of Swedish steel holds the cast iron outer ring firmly against the cylinder wall. If your car is using too much oil, has no pep or power, try it. You'll be amazed by results!

Warning! Read Carefully!

But let a Sealed Power ace mechanic check your car first. Perhaps new valve guides, new bearings or new pistons are needed. Depend upon your Sealed Power mechanic for straight-from-the-shoulder facts. Usually Sealed Power Rings alone will restore new car oil economy. Meanwhile, write for our booklet, "New Low Cost Way to Save Oil and Gas and Increase Pep". It's free! You'll like it!



SEALED POWER CORPORATION

Dept. 278, Muskegon, Mich. • Canadian Factory at Walkerville, Ont.

Manufacturers of Piston Rings, Pistons, Piston Expanders, Piston Pins, Valves and Cylinder Sleeves

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Vol. 68

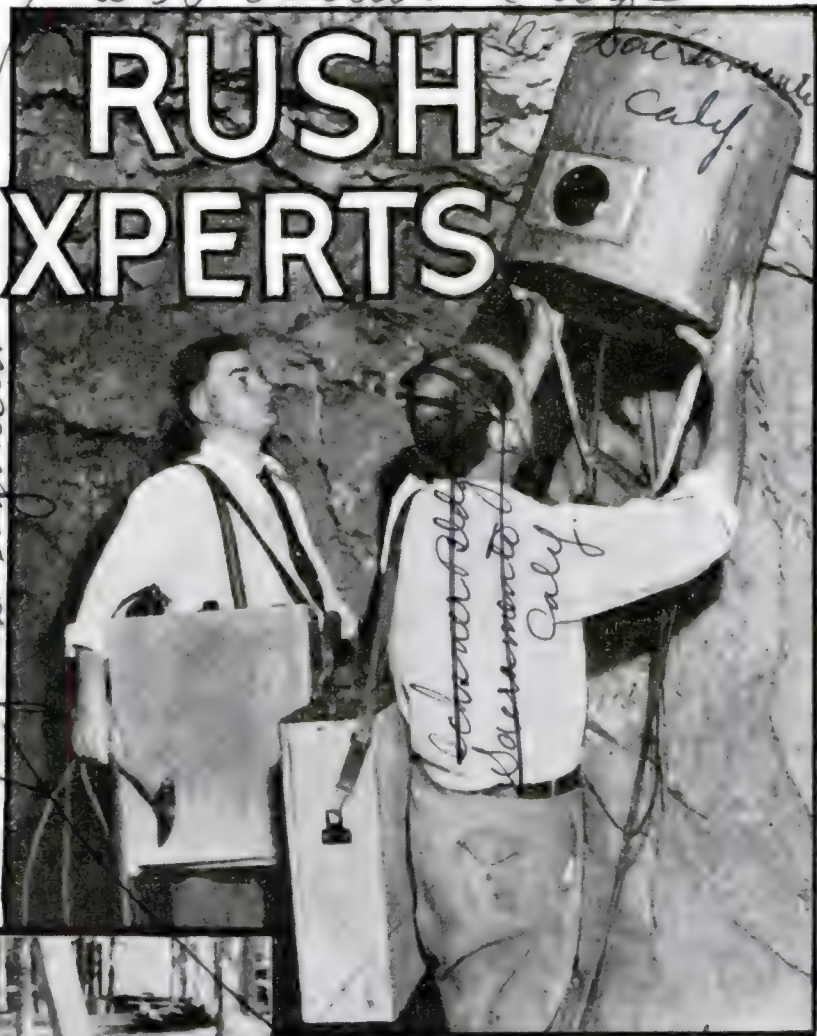
AUGUST, 1937

No. 2

GOLD RUSH of the EXPERTS

GOLD is luring a new army of searchers into abandoned mining fields of the far west. Engineers, chemists and devotees of that newer science, geophysics, are in the vanguard, carrying newly created contrivances which make two ounces appear where an ounce or less would have been produced with older apparatus.

The thirty-five dollar per ounce price tag on gold is a contributing factor in the re-



surge of the gold fever, but experts say that even at the old price of \$20.67 an ounce and with the new methods of mining, some of the old abandoned mining properties might have been revived. The all-time top for gold production in the United States was attained in 1915 with 4,887,604 ounces produced. Gold then sold at the \$20.67 figure. In 1935 the United States Bureau of Mines reported production of 3,546,169 ounces and at thirty-five dollars an ounce that represented an all-time dollar high of \$124,115,915.

Top, hunting lost vein of ore with metal-locating device. Bottom, solid rock core taken out with Newsom driller

J. B. Newsom & Co. Idaho.
Maryland. Mine Corp. Box 123

From Lens and Letters, 474 Chaminé Bldg. New York.

Buyford & Sham (Left) Charles of Sham. Gold
Tubbs Mines, near Mammoth Springs, Calif.

Nevada City, Calif.



Fig Tree Mine

Experts predict that the 1915 production will be exceeded within a very short time, and point to some of the new methods of mining as basis of their belief.

An ultra-modern plant is that of the New Method Mining and Milling company at the Fig Tree Mine in California. The Fig Tree mine is said to have caused the failure of several companies which had to depend on the free gold that it produced. With the gasoline storage-tank plant of the New Method company the Fig Tree is now expected to become a money-maker,

yielding from twenty to \$100 a ton. Gold is produced by the New Method outfit by grinding the ore, and placing it in tanks to be mixed with a chemical formula. Leaching takes place in the tanks, and flour gold is crystallized ready for the mercury to pick it up. When it finally comes out it is in the

solid piece and ready to go to the mint. The plant consists of an ore hopper, a grinding mill, and four large leaching tanks. Processing of the ore at this plant costs about two dollars a ton. The plant represents seven years of experimentation with methods for mining flour gold.

Another aid to quicker and cheaper mining is the contribution of one J. B. Newsom, of Palo Alto, Calif. Mr. Newsom's contrivance is a circular bore that digs shafts at the unbelievable speed of ten feet per day. The driller was completed

after eighteen months of experimentation at the Idaho-Maryland Mine at Grass Valley, Calif. There it was used to drill a shaft, even while it was being perfected, and there its weaknesses were discovered and corrected to produce the finished product. The essential difference between the Newsom drill and other core drills, aside from its larger size, is that the entire machine goes into the hole. Thus time is saved in the handling of drill rods, and no rod tower or rod handling tackle is required, and, as the operator goes into the hole with the machine, he always can control its operation closely. It gouges out a core five feet in diameter, and in



Top, left, control board of earth resistivity instrument. Right, latest gold-producing plant. Bottom, "doodle-bug" dredge for placer mining is another new machine in the low-field field

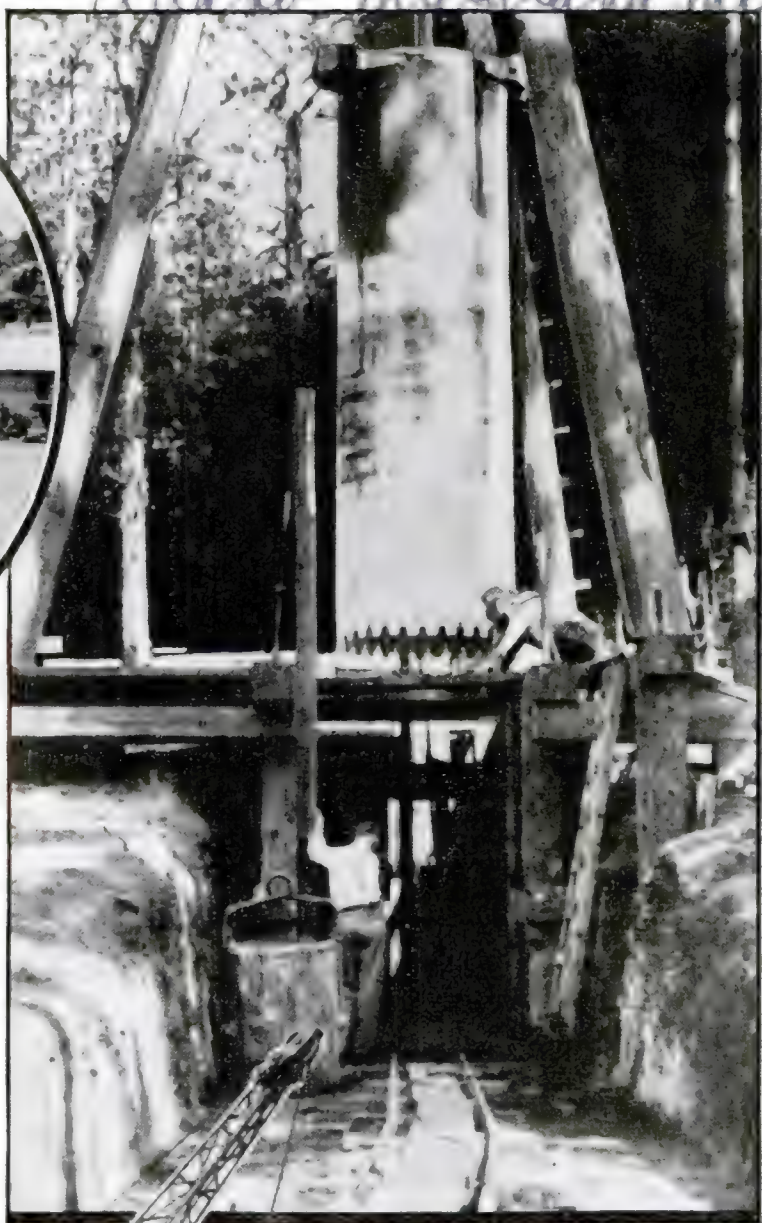
Charles L. Sham
L. Sham and L. Sham

Charles L. Sham
Sacramento, Calif.

Amador County
Sacramento
590
in western
road from
Plymouth
see Feb. 19 1936
200 Redwood Ave

es 578

Idaho mountains mine.

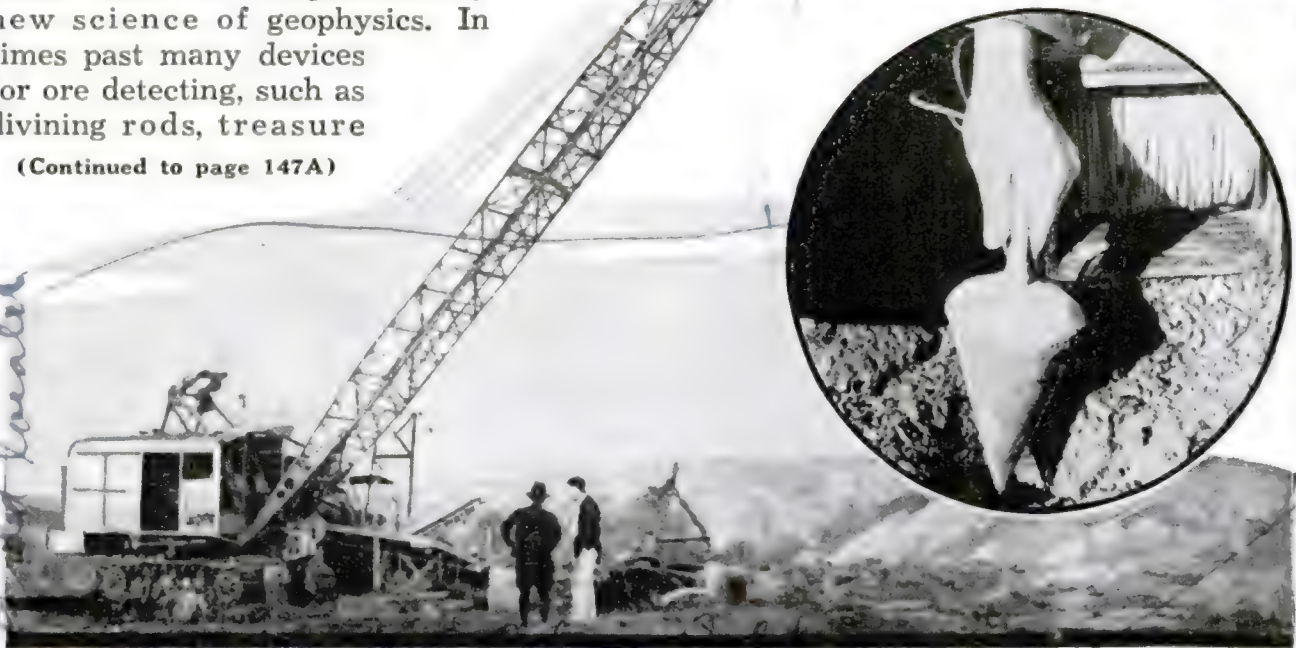


development of A. E. Vandercreek, Sacramento, Calif. 1914

the Idaho mine test the cost of drilling was lower that it would have been with other core drills, despite the fact that the drill itself was being developed as the shaft progressed. Mining men will understand the advance represented by the Newsom drill, as against old-type core drills which bit into the ground at the rate of about four feet a day.

The greatest contribution to modern gold mining, however, comes from the comparatively new science of geophysics. In times past many devices for ore detecting, such as divining rods, treasure

(Continued to page 147A)



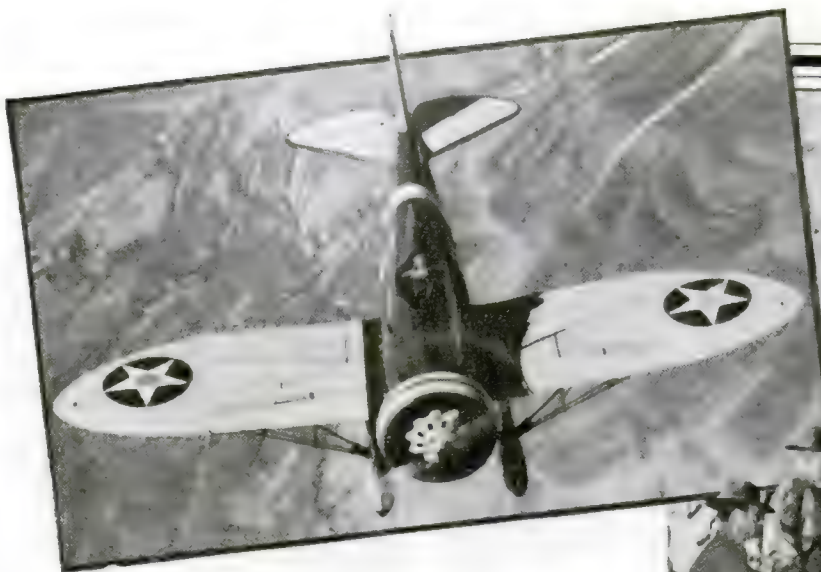
Circle, Gold Reserve mine which is being mined by a new process. Top, right, Newsom's core drill. Bottom, power shovel in open mine. Inset, bottom, setting electrode of gold locator in ground

*developed by J. B. Newsom
Palo Alto, Calif.*

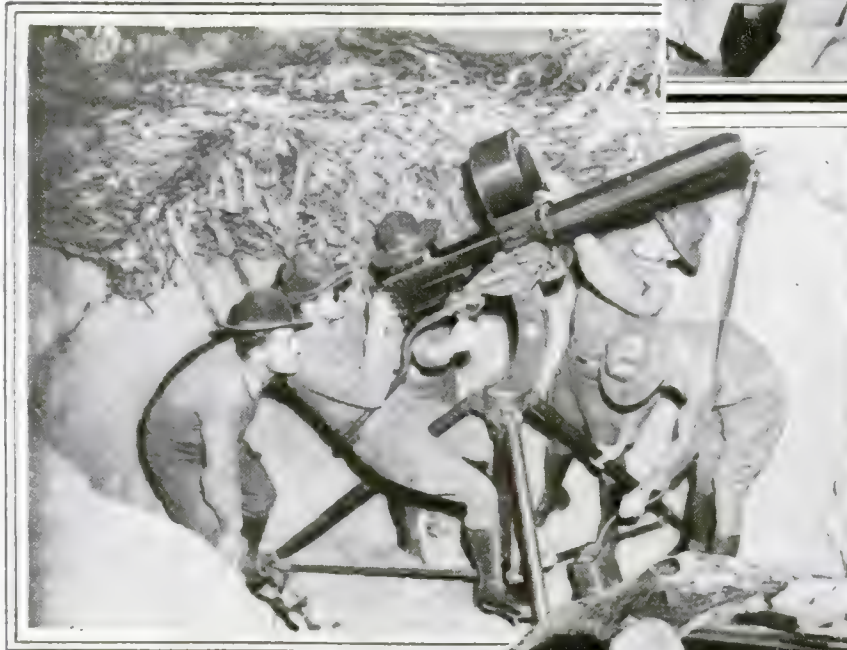
*Idaho east residents
at location*

4 miles from Coalinga, Calif.

Defense Guns and Planes Combat Air Raiders



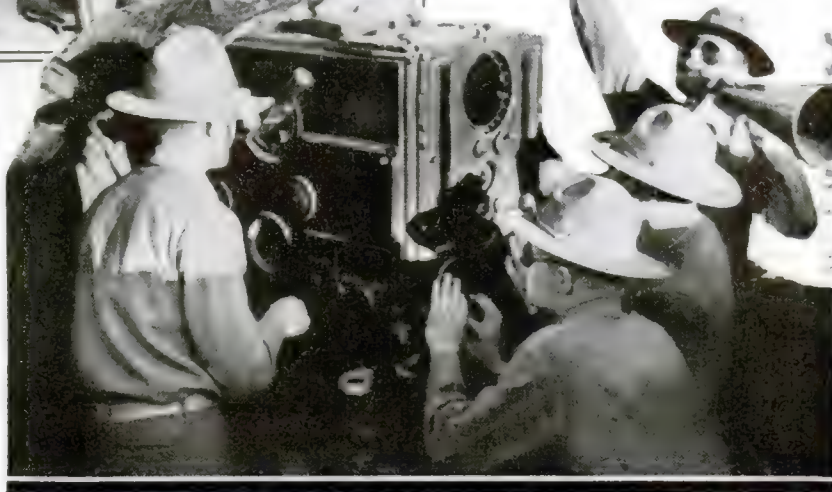
Above, latest Boeing single-seater pursuit plane, used for attacking enemy bombing planes, has high-speed and super-efficient guns. Right, one of the 63d Coast Artillery's three-inch anti-aircraft guns concealed by camouflage and ready to "fire" at attacking planes in recent U. S. maneuvers near Muroc, Calif.



Wade Ward

Left, machine gunners of the 63d Coast Artillery training their anti-aircraft weapon on "enemy" air raiders attacking "targets" outlined on the dry lake near Muroc. Remarkable accuracy is a feature of the latest guns produced for defense against air raids. Note the camouflage net over the machine gun's "nest"

Right, soldiers of the 63d Coast Artillery operating an anti-aircraft range finder on the lake bed at Muroc. This apparatus locates and registers the range and angle of fire for the anti-aircraft batteries so that a deadly defensive shower of shells and bullets may be directed at approaching "enemy" planes. Even the range-finding equipment is partially protected by camouflage from the eyes of observers in raiding planes. This photo was snapped during the recent maneuvers in California



Diesel Streamliners Now Link Coast to Coast

With the assignment of two new streamline Diesel-electric locomotives to the Capitol Limited of the Baltimore and Ohio railroad, Diesel trains for the first time span the continent. These two powerful locomotives, running daily in each direction between Chicago and Washington, are the first of their kind on any trunk line from Chicago eastward. Three years ago the first Diesel-electric streamliner streaked across the coun-



Streamline dual power car at left, built to haul Baltimore and Ohio railroad's Capitol Limited, completes eastern link of Diesel-electric passenger service from coast to coast. Officials are shown in locomotive's control cab above



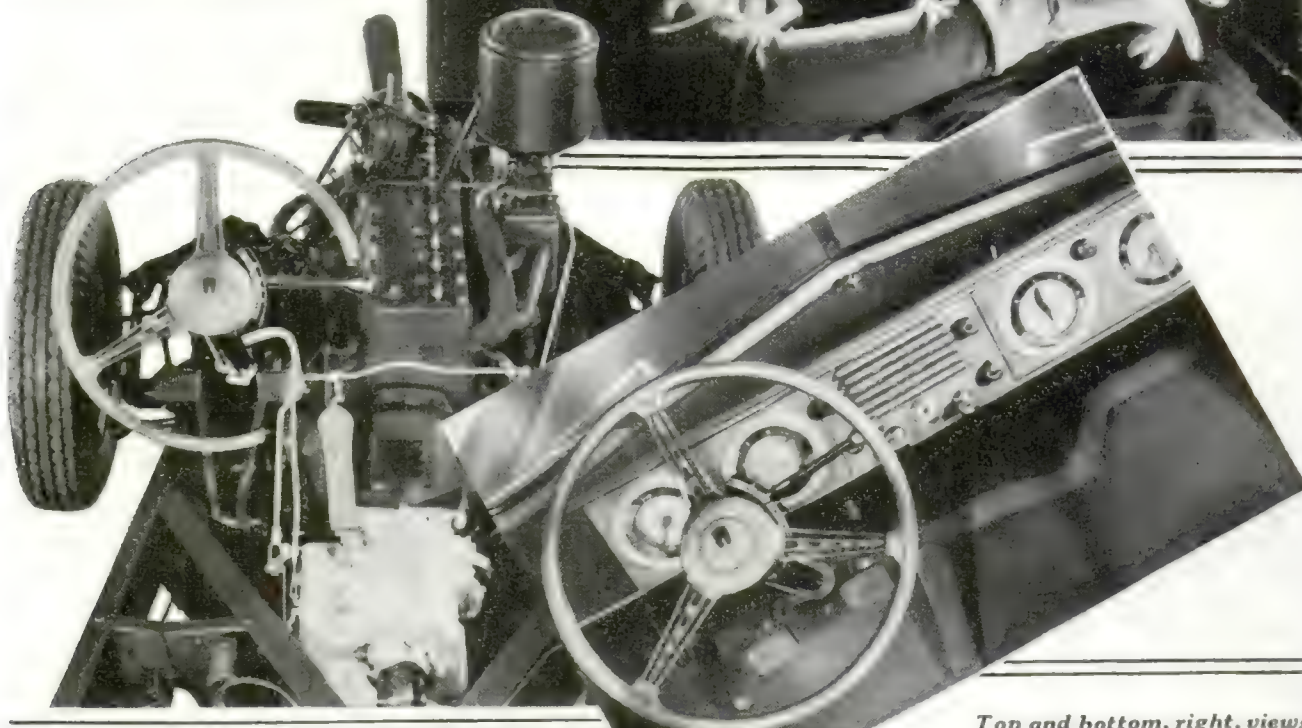
gines are twin-unit power cars delivering a total of 3,600 horsepower. The operator sits in a comfortable adjustable seat in the cab and drives the train with three levers—main throttle, reverse lever and air brake handle. Slanting, automotive-type windshields of thick safety glass, with windshield wipers and hot-air defrosters, give the driver good vision. The cab is steam-heated, with adjustable side windows and no-draft ventilators. To the usual instruments such as the indicating and recording speedometer, air brake gauges and motor dials has been added a "wheel slip" indicator which flashes a red light when any driving wheels slip because of poor track conditions. In the engine room the attendant is warned by four colored lights and an electric gong whenever the engine overheats, oil pressure is low or a boiler is failing.

try to pioneer a new type of railway passenger service, and today a score of these trains are in service, covering a total of 13,000 miles daily. Four trains operate between the Pacific cities and Chicago on thirty-nine and three-quarter hour schedules, and with the Baltimore and Ohio streamliners connecting at Chicago you can ride from San Francisco to Washington in fifty-four hours and ten minutes running time by Diesel. These newest en-

☛ Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information, inclosing return postage.

Automatic Transmission Saves Gas and Power

Providing four forward gears which are selected automatically through a device actuated by oil pressure and engine speed, a new automatic transmission for the automobile saves gas, improves acceleration and reduces engine wear. It eliminates the gear-shift lever from the floor of the driving compartment, employing a small control lever located on the



Top and bottom, right, views of control lever on Oldsmobile steering column. Left, showing means of controlling transmission

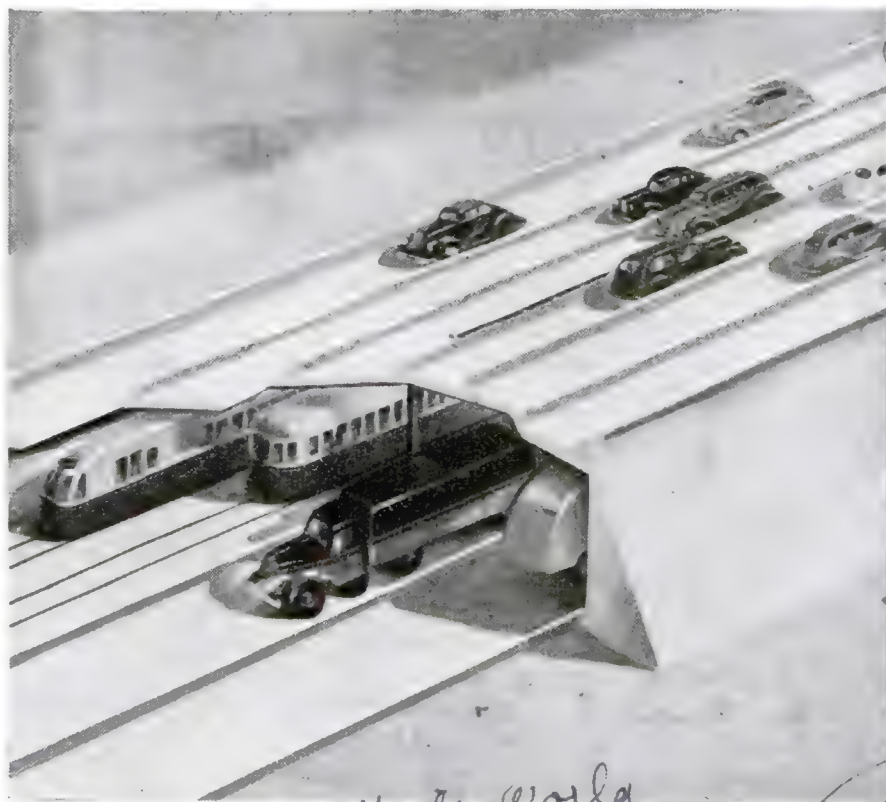
steering column. This lever has four positions, reverse, off and two forward speeds. The first forward position consists of a first and second gear designed for starting when the engine is cold, when the car is on hills or when maximum power is desired. The car is started as usual, by using the clutch, after the control lever is in first forward position. At six miles per hour the gears automatically shift from first to second. Then the driver moves the lever into second forward position, without using the clutch, and the transmission automatically shifts into higher gears until it reaches "super drive" at a speed of twenty-three miles per hour or greater. Extremely fast acceleration or increased

power for hill climbing may be obtained while the car is operating in fourth forward gear, or super drive, by depressing the accelerator pedal to the floorboard. This causes the transmission to shift into third or "pickup" gear, which operates as long as the accelerator pedal is depressed or until the car attains a speed of approximately sixty-five miles per hour. Then the shift back into super drive occurs automatically. At speeds below fifty the control lever may be shifted back into first forward position, causing the lower gears to retard the speed of the car on down-

*Lansing Mich
es 57*

Road to Span Lake Michigan Is Plan to Speed Traffic East

grades. The shift to reverse also is made manually, but may be accomplished only by pressing a lock button at the end of the control lever. This prevents accidental shifting into reverse. The super drive has the effect of the "overdrive" and "cruising gear" featured by other manufacturers in that it provides a low axle ratio, permitting the engine to work slower without reducing the speed of the car. A ten to fifteen per cent increase in gasoline mileage is claimed, compared to fuel consumption of a car equipped with conventional transmission. The automatic transmission, designed by Olds Motor Works engineers, consists primarily of two planetary gear sets which replace the conventional forward speed gears. These gears are placed one in front of the other, so that the power from the engine may be transmitted through either or both gear sets. The automatic selection of the most efficient gear for each speed is controlled by a centrifugal governor incorporated into the transmission which controls the shifting mechanism. The shift from one gear to the other is accomplished through hydraulically operated pistons that control brake bands on the planetary gear sets and clutches within the planetary units. Thus, when the transmission is in low gear the brake bands of both gear sets are held tightly against the drums and the power is transmitted through the two sets of gears. In second gear the brake band of the forward gear set is released and power transmitted through the rear gear set. In third, the brake band on the rear gear set is released and the drive is through the forward gear. In super drive, the bands on both gear sets are released and power is transmitted directly from engine to rear axle. Oil pressure for operating the transmission is generated by a built-in pump.

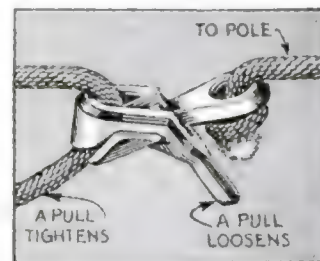


Wide world
Drawing of twin-deck super-highway for automobiles, trucks and electric lines, which engineers suggest building across Lake Michigan

To link Chicago with the east by an express highway, Chicago men propose a double-deck super-highway that would span Lake Michigan. Their plan calls for an island at the mid-point of the road between Chicago and the Indiana shore. A six-lane upper deck would carry automobile traffic, and below it would be four lanes for trucks and interurban lines.

Rope Clamp Gives More Tension When Line Is Pulled

Made so that a pull on the rope will increase tension, a simplified clamp is available for use on clotheslines, tennis nets, tents and awnings. Regardless of tension, the clamp maintains a non-slip grip which can be loosened only by pulling the trigger. Round leather or cord rope may be used in the device.



*Paul Mandeville Raymould
Tear and Raymould
Tel. 6-1000
magazine sh.
newark, N.J.*

Cashier Snaps Steel Shutters to Foil Robber



at a remote point could close the shutters if the cashier at the window is unable. A twenty-seven pound weight holds the shutters open during normal business. They are made of three-sixteenths inch cold rolled steel, with all rails chromium-plated. Once installed, there is no operating expense.

Imagine the surprise of this robber! Just as he pokes a pistol at bank teller, a touch of foot pedal in cage snaps steel shutters closed



If a robber should confront the cashier of a Quebec bank, steel shutters would suddenly snap shut, converting the open cashier's cage into a steel-walled chamber with no opening for gun muzzle or bullet. These shutters, installed recently, are operated instantly at the touch of a foot lever. The same lever sets off a robbery alarm and clicks the shutter of a camera which photographs the criminal in front of the cage. Dual control of the lever is provided so that a clerk

Fire Chief Uses Loudspeaker to Speed Up Alarm System

Loudspeakers are replacing the old inter-station gong system to speed up the response of fire companies to alarms in Memphis. The conventional method was to notify all stations of the location of a fire by a code of electric bells. When an alarm comes to Memphis fire headquarters, the dispatcher glances at a card index to learn which company covers the district,

then by loudspeaker he directs that company to the fire. It is expected that when this system is fully installed, fire trucks will be speeding to the fire within ten seconds after the alarm reaches headquarters.

Thirteen billion dollars are invested in the electric power industry—more than the gold in the United States treasury.

Capt. Robert E. Sloan,
Crosstown Station
Memphis, Tenn.

Ado. Stone and
Webster, 20 Broad
St. New York

2333.
A FORTY-FOOT twin-screw craft capable
of taking the family for a week-end vacation
or an all-summer cruise.

Baltzer Boat Co.
Mass. Filo.
Medford, Mass.

Carl. Erie & Snelgrove
c/o Ireneva Daily News
Ireneva, N.Y.

169



169

Owner Robert E. Todd
Sag Harbor, L.I., New York

Hawaiian Cruisers, Inc.
Clason Point, N.Y.



190

Karina *LS 53*
A SEAWORTHY floating home powered by two 150-horsepower Diesel engines
and capable of taking you almost anywhere you want to go.

PART I

HUNDREDS of American families have discovered a new way to live. They are closing up homes or deserting city apartments during the summer for life aboard that marvel of comfort, compactness and seaworthiness—the modern small cruising motorboat. Naval architects and boat builders have created a home afloat that is within the reach of thousands.

The trend to the water has become increasingly evident the last few years. There were 319,404 motorboats numbered at the forty-four federal customs houses, according to a recent survey made by the National Association of Engine and Boat Manufacturers for war department engineers. Numbered motorboats in use on federal waterways throughout the country more than doubled in the nine-year period covered, the survey disclosed. From 208,037

motorboats in 1926, the fleet was increased by 111,367 craft.

Nowhere is mechanical progress better exemplified than in the motorboat of today. Gone are the days of steam and naphtha launches with their gingerbread and scalloped awnings overhead. Gone, too, are their successors, the slim and wet toothpick type of hull that sliced through the water and rolled perilously in even a moderate sea. Relegated with them to the limbo of forgotten things of the sea in Davy Jones's locker, are the huge, cold hunks of balky iron that were the early two-cycle marine engines with make and break, or jump spark ignition.

The modern motorboat is a thing of comfort and luxury. Those gleaming mahogany runabouts that dash across the water at speeds from twenty-five to more than sixty miles an hour have ultra-soft leather cushions, usually filled

2053

41 foot cruiser
also work?
Port also, N.Y.

COMFORTABLE berths,
right, in forward cabin of
forty-one foot cruiser. Be-
low, roomy cabin of a sixty-
foot sailing boat with an
auxiliary power plant.

gas or diesel
engine.



Designed by Sparkman and Stephens
11 E. 44th St. New York City
M. M. Davis and Sons, Inc.
St. Louis, Mo. Cruiser engine



192
 THERE'S plenty of room for all the family and a guest or two in the wide and roomy after cockpit of this thirty-two foot craft.

Wanderer

American Car and Foundry Co. 36 Church St. New York

with kapok to act as life preservers. The trim cruisers, some with speeds up to thirty miles an hour, but mostly in the twelve to eighteen mile class, are literally floating homes with everything from dining nooks to shower baths.

Living afloat is an experience, once tried under proper conditions, that has few equals from the standpoint of health, happiness, comfort and freedom.

Within the comparatively small space of thirty feet in length, by nine to ten feet of beam, about average specifications for a medium-priced cruiser although 1937 models show a trend toward more beam, are to be found complete living accommodations for at least four people. Such a little ship is capable of taking this family out on the water for an indefinite time—a week end, or an entire

summer, a short day cruise or a trip to Florida and return. It is poor policy, however, to crowd too many people aboard to live for any extended period. It is best to have only the immediate family aboard if you want frictionless peace and comfort.

The average landlubber has little conception of the interior of the modern small cruiser. There are comfortable berths, usually Pullman-style uppers and lowers in the single-cabin type of craft; full headroom for six-footers and a complete galley that surpasses the most compact kitchen of a modern home.

There are electric lights, toilet facilities, running water, and plenty of storage space with full-length clothes lockers. And when you grow tired of the scenery and surroundings of your an-

Illustration by [illegible]



Ad for
Atlantic Sun Co 193
Mutual Sun Co
or Motorboating

253



AN OCEAN-GOING
cabin boat which serves
as a winter home in
tropical waters, and the
kitchen and dinette of
a thirty-two footer.

Wanderer

American Latex Laundry Co.
36 Church St New York

Higgins Industries, Inc.
1955 St. Charles Ave.

New Orleans
La.



es 53

194

THREE "tunnel stern" boats of very shallow draft which have no trouble navigating river shoals and are also seaworthy for the open water.

chorage it is only necessary to up anchor and away to newer and bluer waters.

Mr. and Mrs. General Public are learning about boats, and learning fast. They jammed three spacious floors of the Grand Central Palace in New York City for the entire week of the annual National Motor Boat Show. Literally thousands of interested people stood patiently in line during the week to climb the gangways and inspect the neat and comfortable interiors of the fleet of cruising motorboats displayed by the nation's boat builders.

The boat-wise dropped to hands and knees to peer underneath the smooth and gleaming hulls and cast a knowing eye at struts, shafts, bottom planking, noting hull lines, talking glibly with overwhelmed salesmen about stuffing boxes, cutless-rubber shaft bearings, engine revolutions, propeller pitch, and such mysteries to the landlubber as tachometers, binnacles, backfire traps, auto-

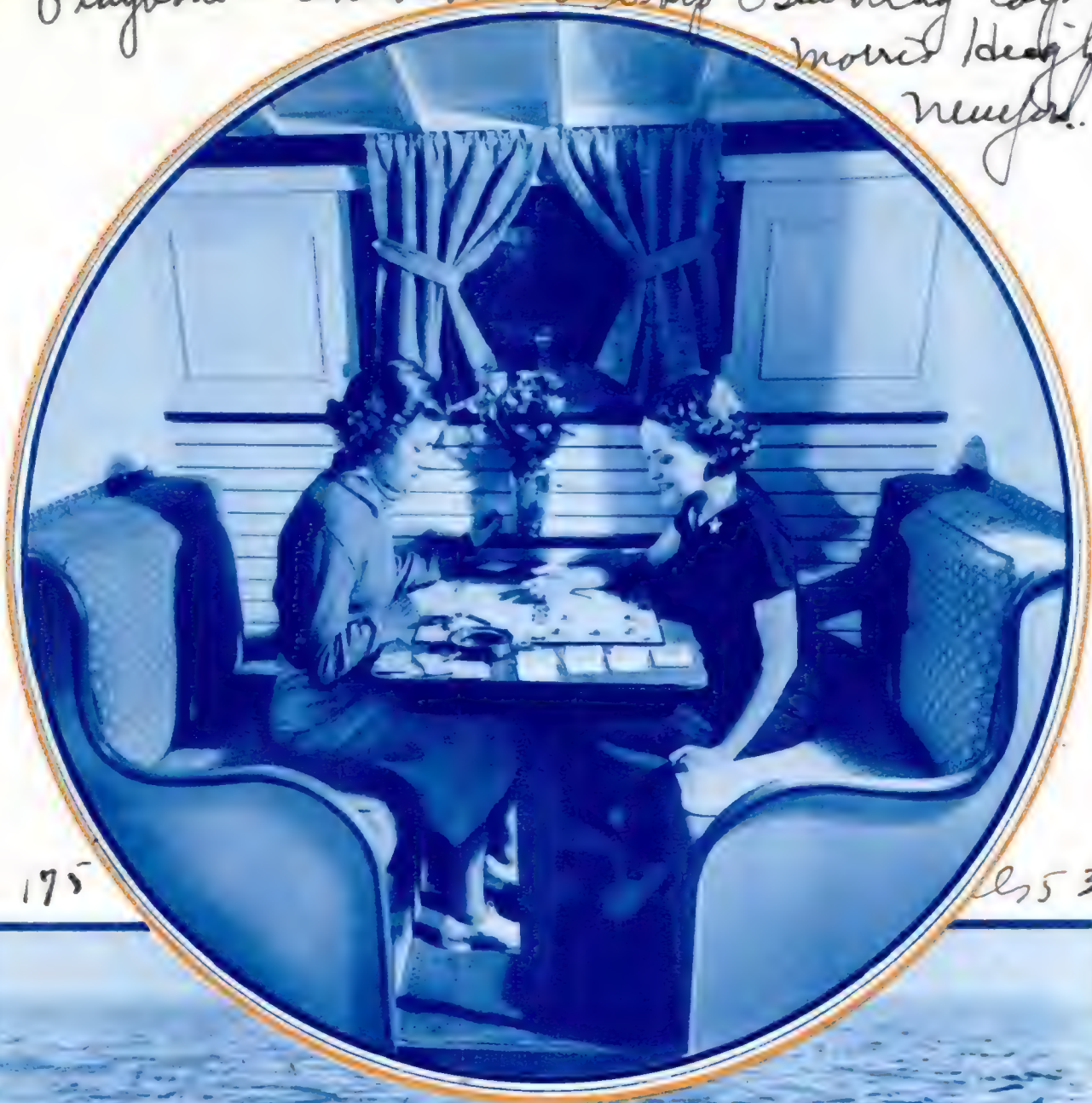
matic bilge pumps, exhaust blowers, and other accessories of the 1937 boat.

The steadily growing interest in the family cruiser was again one of the outstanding trends noted by show officials and boat builders. It was apparent to them that the average boatman wants a craft on which he can take his family along and on which they can live in comfort for as long as desired.

More than one interested prospect mentioned that he had read about the construction of a "marina" in his neighborhood and after investigating the meaning of this new word, had become enthused about the idea of living afloat. What is a marina? It is a modern boat basin where a small cruiser can be anchored in perfect safety, the family left aboard while the man of the "house" hies himself off to business via some means of land transportation.

A visit to the clean, supervised and safe marinas of Florida in the winter

Playboat - Consolidated Ship Building Corp.
 moves height
 new for.



175

1753



DINETTE of a forty-two foot power boat which can be transformed into a Pullman-type berth at night. Below, this boat has just run over a log, a feat made possible by its unique type of "spoonbill" bow.

Higgins Industries, 1755 St Charles,
 Ave, New Orleans, La

time tells more vividly than words the extent this living afloat is taking hold of Americans. Hundreds of cruisers ranging all the way from some in the twenty-foot class to luxurious houseboats and those floating palaces, the big yachts of the wealthy, are in Florida basins every winter.

It is surprising, too, to most casual visitors the number of smaller craft that hail from northern ports and which have come south under their own power. The federal government has provided a protected inland coastal waterway from New York to Miami, except for a twenty-five mile open ocean passage from Sandy Hook to Manasquan Inlet, N. J.

Living aboard is not only a healthful and comfortable means of escaping hotel expenses or rental of furnished flat or house but it also provides a means of seeing Florida not available to those who do not own cruising motorboats. For a small dockage fee, city water and telephone service are handy right at your slip in the marina while electricity can be hooked right into your cruiser if it is wired for city voltage.

(Concluded next month)

es 53

TWENTY-FIVE foot sloop for those who like sailing. It also has an auxiliary motor.

There are sleeping quarters for four.

Playboat

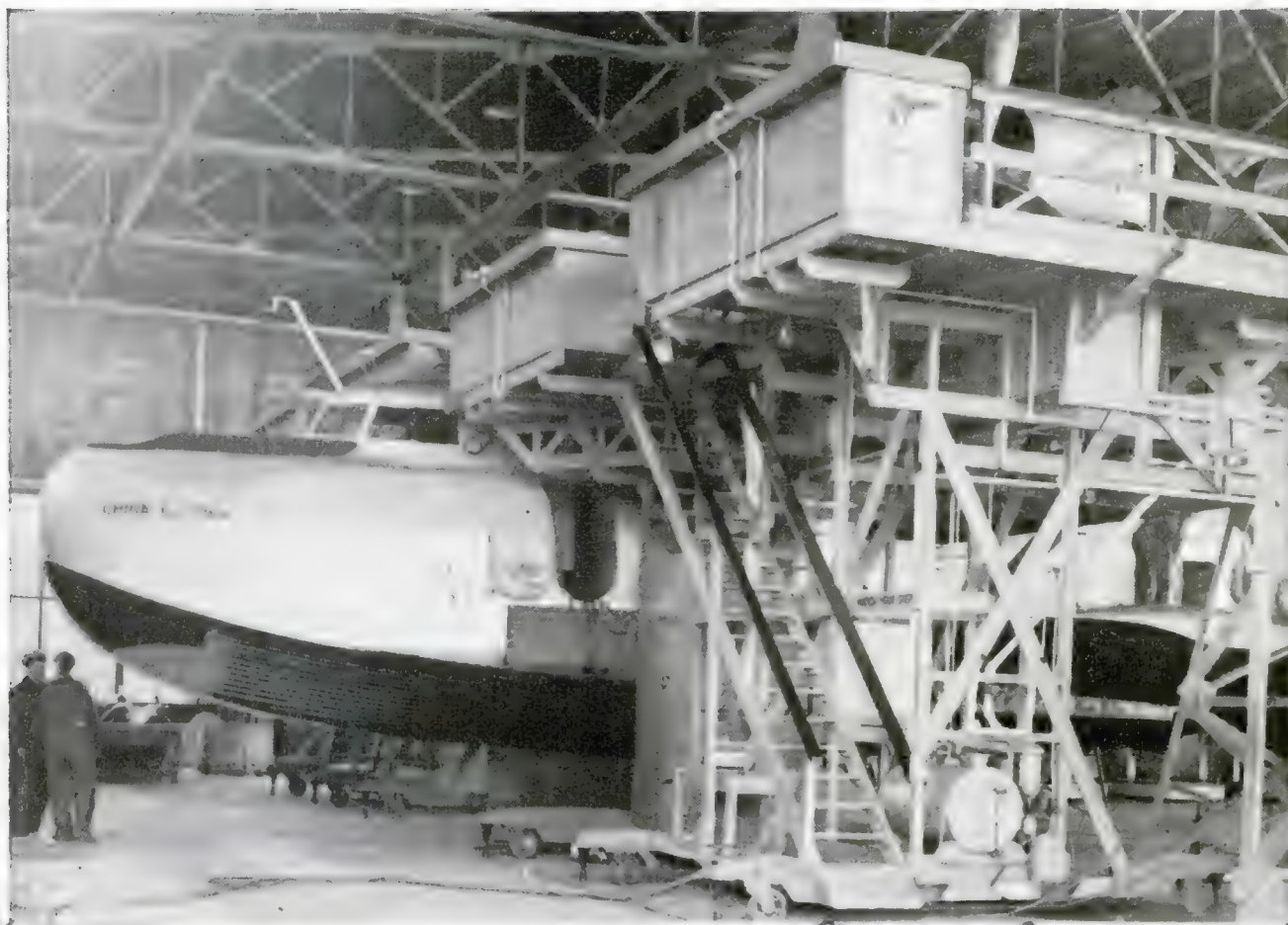
Consolidated Shipbuilding Corp

Morris Heights N.Y.



es 505

Workshop on Stilts Services Clipper Planes



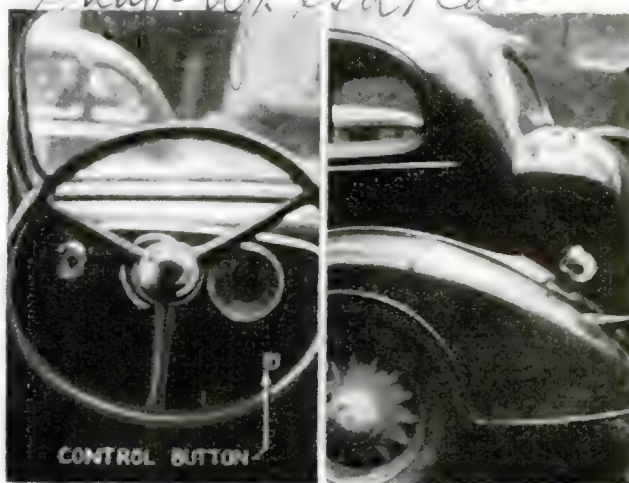
Portable workshop in place, ready for servicing big ocean-going clipper plane. Upper right, note how stand fits around motor to facilitate inspection and repairs. The workshop is moved on small wheels

Mounted on wheeled stilts, a traveling workshop facilitates servicing of the trans-pacific clipper planes at the Alameda, Calif., base of the Pan-American Airways. When the big planes are moved into the hangar, the scaffold-like stand is rolled

up in two sections to fit around the motors and the fuselage, thus making it easy for mechanics to reach any part requiring attention. The gallery for working on the motors is twenty-one feet above the floor of the hangar.

Electrically Locked Gas-Tank Cap Controlled from Dash

Operated by button on the dash, a new electrically locked gas-tank cap has been placed on the market for automobile owners. It is slightly larger than the ordinary gas-tank cap. An electric magnet, actuated by the dash button, pulls a lever to release the cap. A spring in the hinge of the cap causes it to open. The cap is closed by pressing it down. It may be wired so that it cannot be opened when the key is out of the ignition lock.



Left, control button on dash which releases gas cap, shown in photo at right

[[The department of agriculture estimates there are 123,000,000 rats in the United States—almost as many rats as people.

Clp. 5/2/37

Steel Bros. Co.
445 Winchester Ave

askland/ky

Airplane X-Ray Reveals Flaws in Metal



Portable X-ray equipment being used to test various metal parts of airplane

When Amelia Earhart's big plane was placed under a newly developed X-ray machine recently, several flaws were discovered which might have forced down the aviatrix at some point on her round-the-world flight if they had not been corrected. The secret of the new X-ray is a small tube which pours out rays powerful enough to penetrate eighteen inches of solid aluminum. Designed to send 280,000-volt rays through a plane's wing, the machine is said to reveal flaws as small as one-millionth of an inch.

Invisible Electric Trap Guards Area Against Intruders

How an invisible network of electric rays can be used to trap intruders and sound an alarm without their knowing it was demonstrated recently. Attempts to enter a 13,000-square foot area or to move from one zone to another were defeated at every turn in the test. Developed with the aid of General Electric engineers the de-

vice relies principally on the phototube, or electric eye, to foil the intruder. The network is made up of the beam from a standard automobile headlamp from which all visible rays of the light spectrum have been filtered. By a multiple system of mirrors this single invisible beam may be reflected back and forth across a room, around corners and at different angles and levels until the guarded area is completely protected. The system is extremely flexible in that the energy released by interfering with any beam can be used for sounding an outside bell or siren, or transmitting alarms by telephone.

"Telescope" Awnings of Metal Have Long Useful Life

Metal awnings made of "telescoping" segments are available in galvanized iron, aluminum, copper or stainless steel. They are raised or lowered by cable from inside the window. Being of metal, they can be used throughout the year.



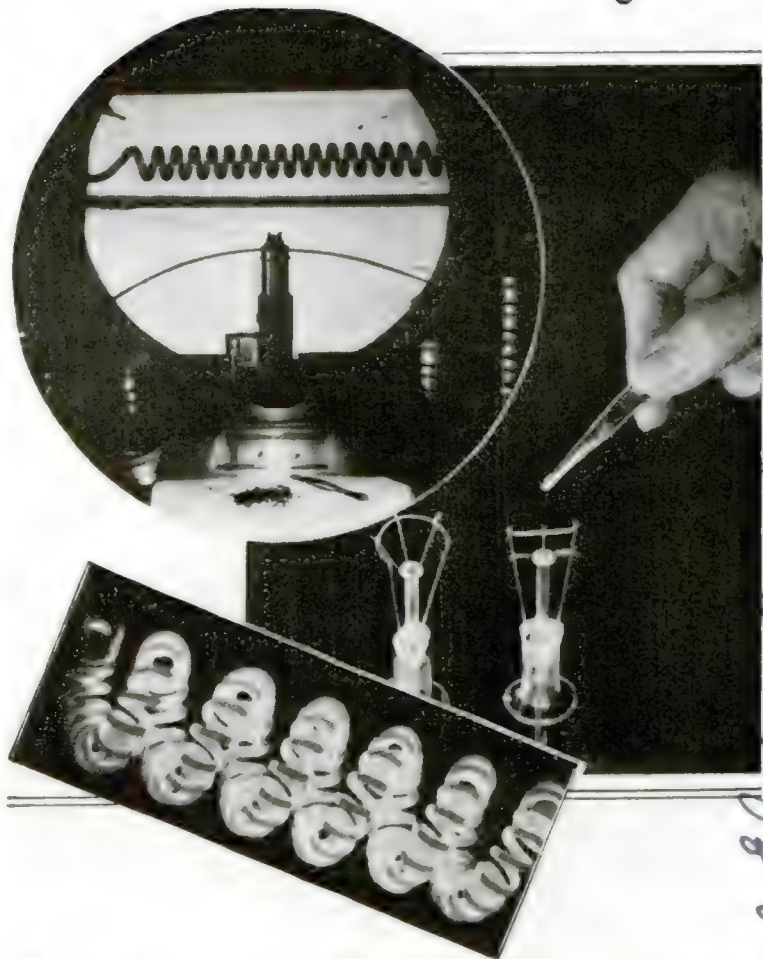
Two views of metal awning, operated from inside house. It can be used throughout the year

The Lubart Shade Corp. South
276 Clifton Ave. N.Y.C.

Signalphone Corporation
of America, 570 Lexington Ave
New York

Westinghouse Electric
Is 527 East Pittsburgh Pa.
POPULAR MECHANICS
More Light Produced by Improved Filaments

Increasing the light output by ten per cent without additional electricity, new high-efficiency tungsten lamp filaments soon will be saving the public millions of dollars each year. First drawn into a straight wire 19/10000 of an inch in diameter, so fine it is almost invisible, the tungsten then is wound, 335 turns to the inch, around a thin molybdenum wire or mandrel, leaving the coils 1/1000 of an inch apart. The coils must be kept close together to reduce heat loss, but must not touch because a short circuit would cause immediate lamp failure. Then the coiled wire is coiled on another mandrel, seventy turns to the inch, with a spacing of 7/1000 of an inch between the secondary coils. This process reduces the twenty-inch wire to a length of five-eighths inch. Following the second coiling the mandrel is dissolved out by means of chemicals. Use of certain gases within the bulb introduces pressure which reduces filament evaporation, with its accompanying evil of bulb blackening, and allows the lamp to operate at a higher temperature for the same life. Presence of gas, however, is conducive to cooling of the filament, reducing the temperature and also the light output. This problem



Several views of improved filaments which give more light without increasing amount of electricity used

has been solved by reducing the length of the filament, thus lowering the heat loss and permitting the lamp to give ten per cent more light for the same amount of current. Gas employed in the new lamps is a mixture of nitrogen and argon.

Is 566
Small Dolly for Moving Trailer Fits into Hitching Socket



Pressing down handle of dolly lifts trailer off its parking wheel. It is easy to maneuver even a heavily loaded trailer in tight parking spaces

Even a heavily loaded trailer can be moved about and maneuvered in tight parking spaces by means of a two-wheeled dolly. Its ball tip fits into the socket of the trailer's hitching mechanism. After raising the handle to fit ball into socket, a downward push lifts the trailer off its parking wheel. The upright column is adjustable vertically from fifteen to twenty inches.

Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information, inclosing return postage.

Saginaw Stamping
Tool Co. 68 Williams Saginaw, Mich

20 443. Cmt. Walter & Burton
1032 Florida Ave. Akron, Ohio

CELLULOID MODELS-



machinery design. The use of models in industry is an old story. The patternmaker who whittles a machine part from wood so that it can be cast in metal is really a model builder working on a scale of one to one. Airplanes and automobiles are modeled in wood and similar materials before they are built full size.

At the Westinghouse Electric and Manufacturing company's turbine division in Philadelphia, where research engineers now employ celluloid for building model turbines and other machines, wood was used for years as a model material. About six years ago, the engineers were working with a model boat that was to be propelled by storage batteries. No batteries small

CELLULOID is becoming a useful tool of engineering science because it can be substituted for steel in the testing of machines yet to be built. It is used in modern industry as a material for making scale models of machinery still in the blueprint stage. For this purpose, it threatens to oust wood and metal because of its transparency, ease of handling, and its steel-like behavior when welded together or subjected to various tests.

Engineers of some industrial laboratories where celluloid is now an important research necessity are wondering why no one thought of it seriously as a material for making experimental models until a little more than two years ago. Celluloid has been common and well-known for a long time, yet it still is in its infancy as a raw material for models to be used in testing deflection, efficiency, operation and other features of heavy-



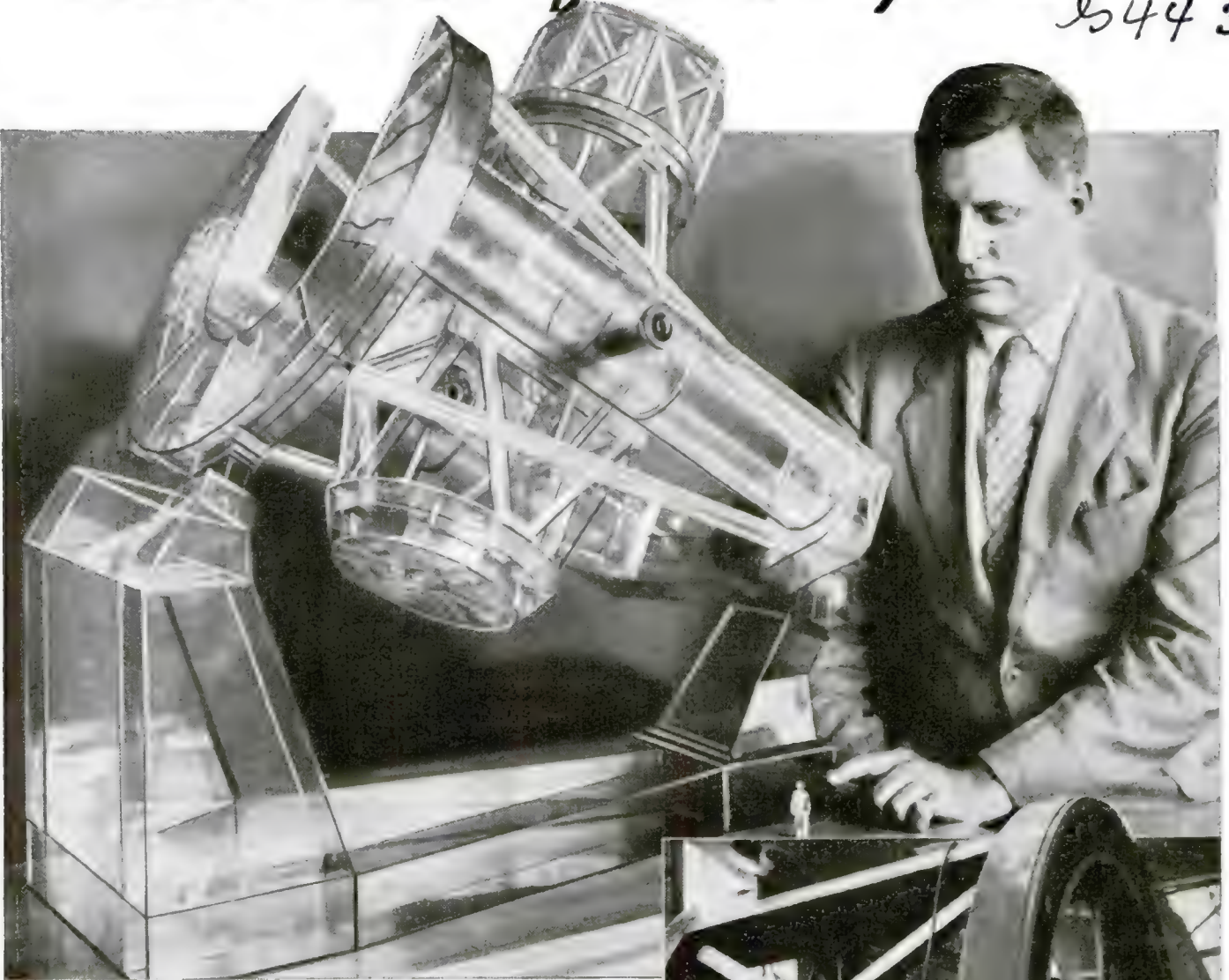
Top, working on celluloid model of giant telescope mounting. Bottom, smoothing corners of model with rotary file

Mr. Palmer
see ang. sup. for maker

*Build at South Phila.
Works of Remondroyd.*

New Tools *for Engineers*

5443



enough were obtainable, so they had to be made. Celluloid was selected as the most convenient material for the cases, because it can be cut and joined together easily. The celluloid batteries were satisfactory, but no one at that time saw in them the promise of a change that may revolutionize the model-building end of industry.

About four years later, the United Engineers and Constructors, Inc., of Philadelphia, found it necessary to build a miniature version of a giant 165,000-kilowatt turbine-driven generating unit to be installed in a Philadelphia electric-power station. The steam turbine itself, generator and various other parts were made of wood in model form to show how the completed power unit would look. Wood was satisfactory, up to a certain point. The engineers wanted to demonstrate how the foundation structure would be made but

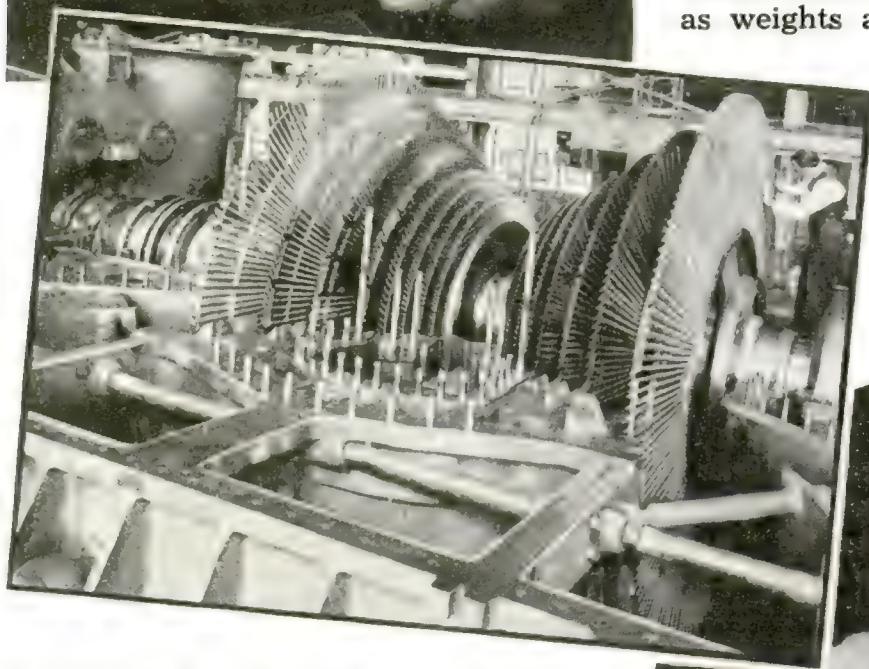


Mr. Palmer
Top, midget figure shows relative size of telescope mounting. Bottom, welding giant prime focus ring of telescope



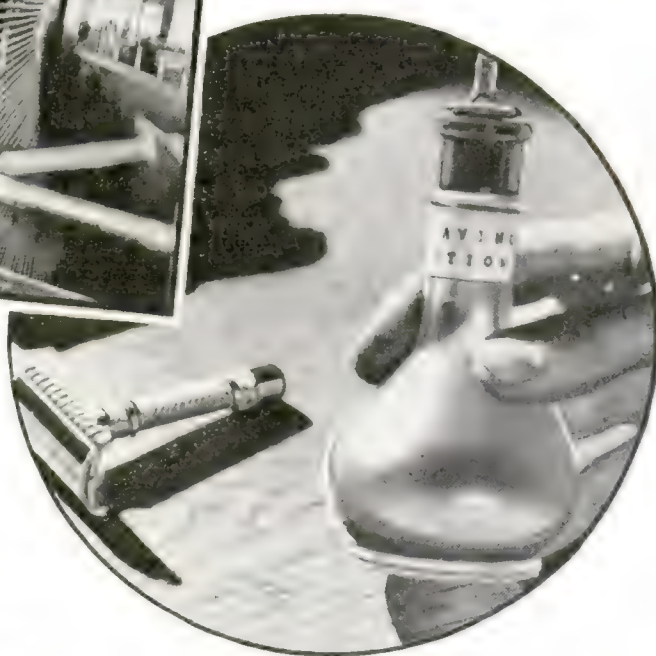
see through wood, and therefore the engineers cannot see, or show other people, what the inside structure looks like and how internal working parts move. There are other advantages on the side of celluloid. By properly juggling such things as the modulus of elasticity, specific gravity and strength, the behavior of celluloid when supporting a weight can be translated into the behavior of full-sized steel structures under similar conditions. In other words, celluloid can be used as a model for steel behavior as well as steel structure. The celluloid models that have replaced wood at the Westinghouse laboratory are employed largely for the measuring of deflection of parts under load. By suspending weights from various parts of a housing for a steam turbine, engineers can determine just how much deflection there will be when similar loads are imposed on the steel parts of the same turbine after it has been built, full-scale, of metal. Measurements of the tiny movements made by parts of a celluloid model as weights are attached to it are made

with "electrified micrometers," which are connected into the circuit of an electric bell or buzzer so that the experimenter knows the instant the micrometer screw touches the part being measured. This pre-



they couldn't do this if floor surfaces were of wood. Something transparent would have to be used. So they used celluloid. The generating unit built with the help of that model is turning out current today in Philadelphia.

Westinghouse engineers now realized that celluloid was a material far superior to wood for creating miniature steam turbines, blowers and other things. A wooden model of a steam turbine may be just as accurate as one of celluloid; but you can't



Top, celluloid is easily cut. Center, designing big machines is easier with celluloid models. Bottom, bottle label protected by celluloid

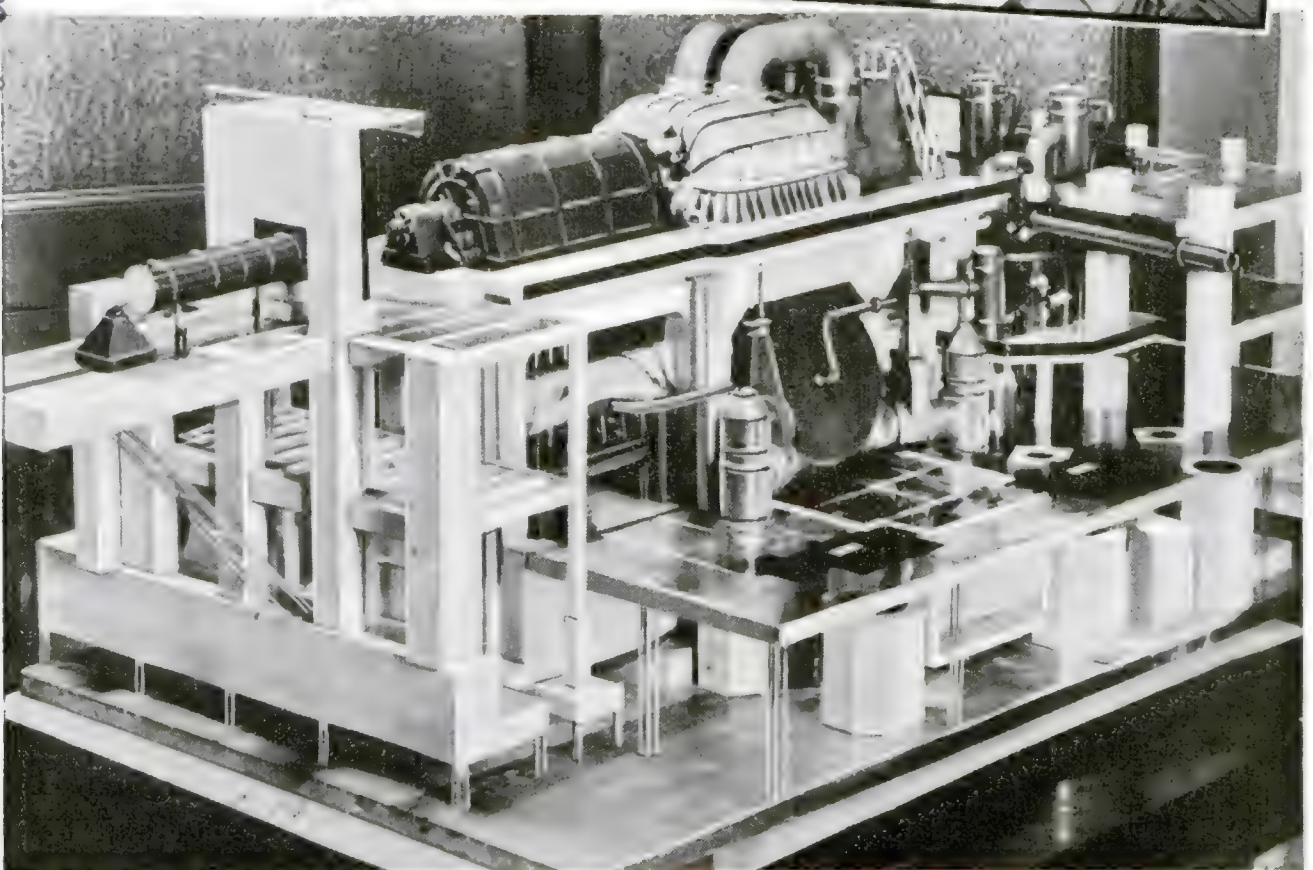
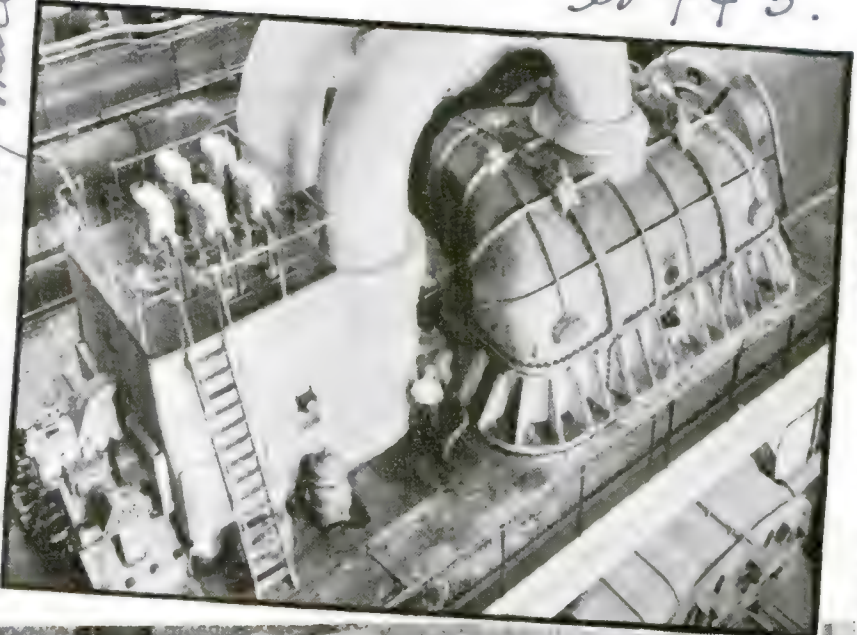
Mallinckrodt Chemical Works
 2nd and Main Streets
 St. Louis, Mo.

Cannot be sent by mail

Es 443.

vents the setting up of false deflections by pressure from the measuring instruments.

The celluloid pieces forming a model are welded together with the aid of acetone, which softens celluloid so that it flows together and becomes one piece, just as a welding torch fuses together two pieces of metal. It was discovered that here is another way in which celluloid imitates steel, for when it is welded with acetone



Top, turbo-electric generating plant built with aid of wood-and-celluloid model. Bottom, the model of turbo-electric generating unit, with celluloid used in floor to reveal structure of foundation

Installation in Phila. Richmond Station

it warps just as welded steel pieces of the same shape warp as a result of heating and cooling. Thus engineers can find the answers to welding problems while the project still is in the model stage. Much of our modern heavy machinery, which a generation ago would have been made of heavy castings, today is built up by welding metal parts together to form the completed structure.

Celluloid models of steam turbines,

blowers, the mounting for the new 200-inch telescope to be erected on Mount Palomar in California, and of other machine units enable engineers to work out details of structure, such as the shape of bracing elements. Besides making it possible to see just how the various parts will behave when subjected to heat of the welding arc or torch, they serve as a proving ground for new ideas in welding. The

(Continued to page 138A)

Handwritten notes and signatures at the bottom of the page, including "W 2550" and other illegible markings.

New Plane Ready for Stratosphere Test Flights



Plane ready for test flights in the stratosphere. The U. S. army designed the ship and some of the features which will make possible experimental journeys into the thin air of high altitudes

Powered by two special supercharged engines, a Lockheed-Electra experimental airplane has just been completed for tests in the stratosphere. Designed by the U. S. army, the ship has features enabling it to fly in the thin air found several miles

above the earth. Superchargers provide the powerful engines with sufficient air to operate at normal speed in the higher altitudes and a supply of air under compression protects the crew when the ship reaches a level where the air is thin.

Arc Welder Built in Trailer from Odd Automobile Parts

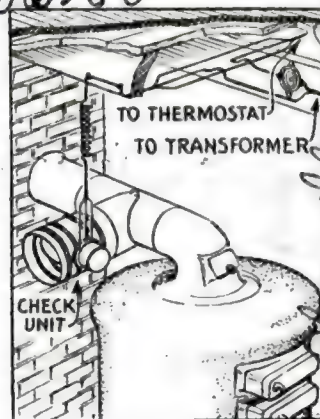


Two views of portable arc-welder built into streamline trailer easily hitched to car and hauled to job

From parts of seven different makes of automobiles a Milwaukee welder built himself a portable arc-welding outfit in a streamline trailer. Quickly coupled, it is ready for work in a hurry. The gasoline motor is in front, the generator over the axle and the control panel is at the rear.

Furnace Air Control Saves Fuel by Slow Burning

By keeping the plant from operating at full speed, the latest furnace control saves fuel and prevents overheating. A check-damper unit, entirely self-contained, is mounted on the smoke pipe to control the air at its source, the stack. No chains or pulleys are used, the motor and damper being directly connected. Air is admitted below



Clyde Locks
625 W. Beulah St.
Milwaukee, Wis.

Cleveland Steel
Products Corp.
Mayfield

Wellington, Ohio.

4531

Milwaukee Road New Bureau.
840 Union Station
POPULAR MECHANICS
Chicago 185

Caboose Gets a Bay Window in Place of Familiar Cupola

the grates to the fuel bed by small hooks or angles inserted under the ash-pit door to hold it open only a small amount, thus restricting the air flow. The damper control is connected to the usual room thermostat. Upon demand of the thermostat, the damper closes and the restricted draft arrangement makes it impossible for the fire to over-accelerate. As a result combustion picks up slowly, gradually producing enough heat which has ample time for transmission through the heating surfaces to the rooms. When sufficient heat has been produced to satisfy the thermostat, the check damper opens, completely by-passing the air through the stack and relieving the ash-pit draft except for a very slight amount of air which filters through the fixed opening permitted by the draft door hook. This is sufficient to support combustion at a slow rate through the deceleration period. Instead of operating on the "full speed" to "dead stop" principle, the control regulates the furnace at "slow" and "medium." The control eliminates opening and closing of the draft door.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped, self-addressed envelope.



Trainmen at desk and on watch in bay window of restyled caboose. Below, note how protruding window has replaced cupola as observation post

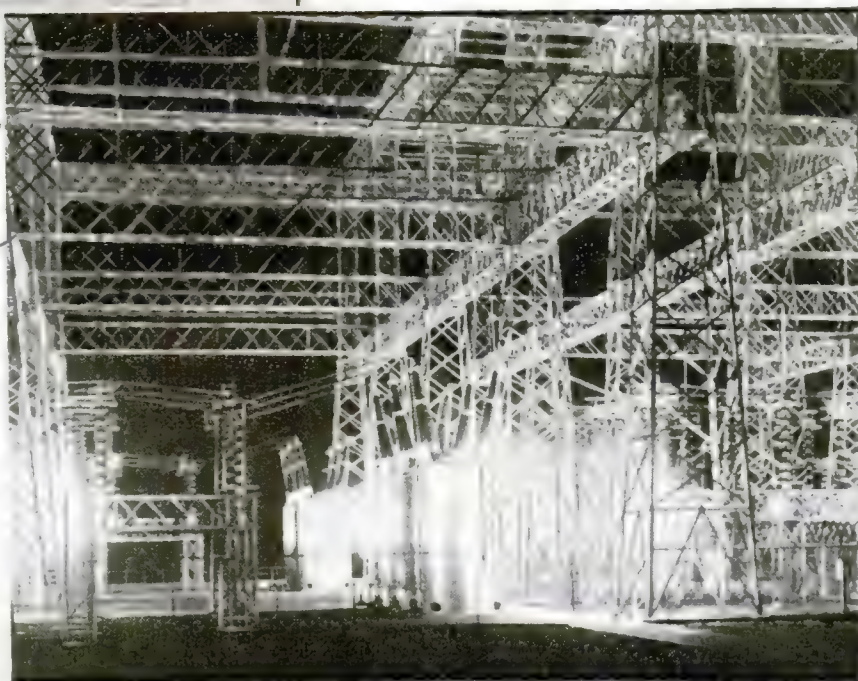
Bay windows are replacing the traditional cupola on the old freight caboose. The cupola has always been an observation post from which brakemen could watch over the long line of freight cars ahead, but higher boxcars being built today sometimes obstruct the view. The Milwaukee railroad is rebuilding its fleet of 900 cabooses, removing the roof-top cupola and installing bay windows on each side. From the bay, a brakeman can watch the full length of the train. The cabooses are being dressed with aluminum paint inside and out for coolness. Outside, black safety rails and ladders show up clearly against the aluminum paint.

Vast Lake Starts 287,000-Volt River of Power



72,200 acres of once desert land. The huge generators settled down on June 1 to continuous, routine production of energy; four 115,000-horsepower units are in operation and ultimately there will be a battery of fifteen such generators and two more of 55,000 horsepower. A high-voltage switching yard routes the power over the main line to Los Angeles at 287,000 volts. The power travels over 270 miles of mountain and desert, then at the gates of Los Angeles it is stepped down to 132,000 volts by seven gigantic transformers such as that shown on the cover. Each transformer, as large as two boxcars standing on end, can handle 80,000 kilovolt-amperes.

From the vast pool of Lake Mead, where Boulder Dam has stored water enough to supply the homes of this country for three years, a 287,000-volt river of power is flowing. This tremendous power plant can deliver 1,250,000,000 kilowatt-hours of electric energy per year. Above the dam in this world's greatest man-made lake stand 11,000,000 acre-feet of water, still rising with spring freshets. The lake extends 101 miles up the Colorado river, covering



Top, four 115,000-horsepower generators at Boulder Dam. Below, high-voltage switching yard which starts power to Los Angeles

Freight Trailer with Motor Helps Truck on Hard Pulls

Equipped with motor to help the towing vehicle on hard pulls, a new freight trailer functions like the booster locomotive behind a long train. Complete synchronization of power plant in truck and in trailer is accomplished by connecting the two transmissions, throttles and clutches by a hydraulic system. Controls in the truck

cab operate both motors. The trailer's engine is installed under the frame. Air brakes operating from its own motor control the trailer on down grades. A truck with motorized trailer can attain a speed of eighteen miles per hour on grades negotiated with difficulty at eight miles per hour by a truck towing the trailer with-

Best Trailer Co. Los Angeles Calif

out motor. Safety from skidding and power to pull out of muddy ground are provided by the traction on both rear wheels of the truck and the wheels of the trailer. A conventional torque tube and rear axle assembly are substituted for the front axle of the dual rear axles of the trailer. Spring suspension of the dual rear axles equalizes braking on both axles, eliminating the bouncing of the front wheels.

Body Energy Tester Finds Women Are Hardier Than Men

That women are hardier than men is the conclusion reached by Dr. Jakob A. Stekol after tests with an instrument which measures the creation of body energy and the giving off of heat. His findings indicate that even after an eighteen-hour fast women consume ten per cent less of their energy reserves than men to keep going. Measurements with the instrument, which checks on the intake of oxygen, on the oxydizing of food and the creation of body energy, also show the nutritional value of different foods, pointing the way to a proper diet.



Woman subject being tested for body energy. The study aids in prescribing diet

Professor of Nutrition
Fordham University

Image of Air Flow on Model Aids in Study of Streamlining



Demonstrating the way air flows around model. Engineers find this projection makes easier the study of streamlining

Projecting the image of an object while air is flowing around it enables engineers to study visually the effect of streamlining. This method of facilitating the study of streamlining is called the Schlieren effect. The image of any scale model object may be projected, together with air flowing around it, demonstrating wind resistance at any point.

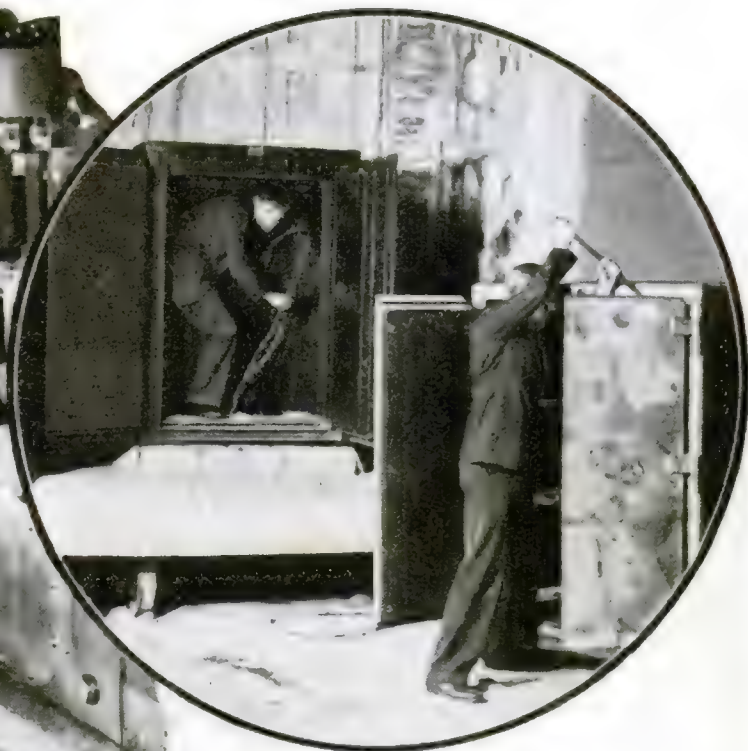
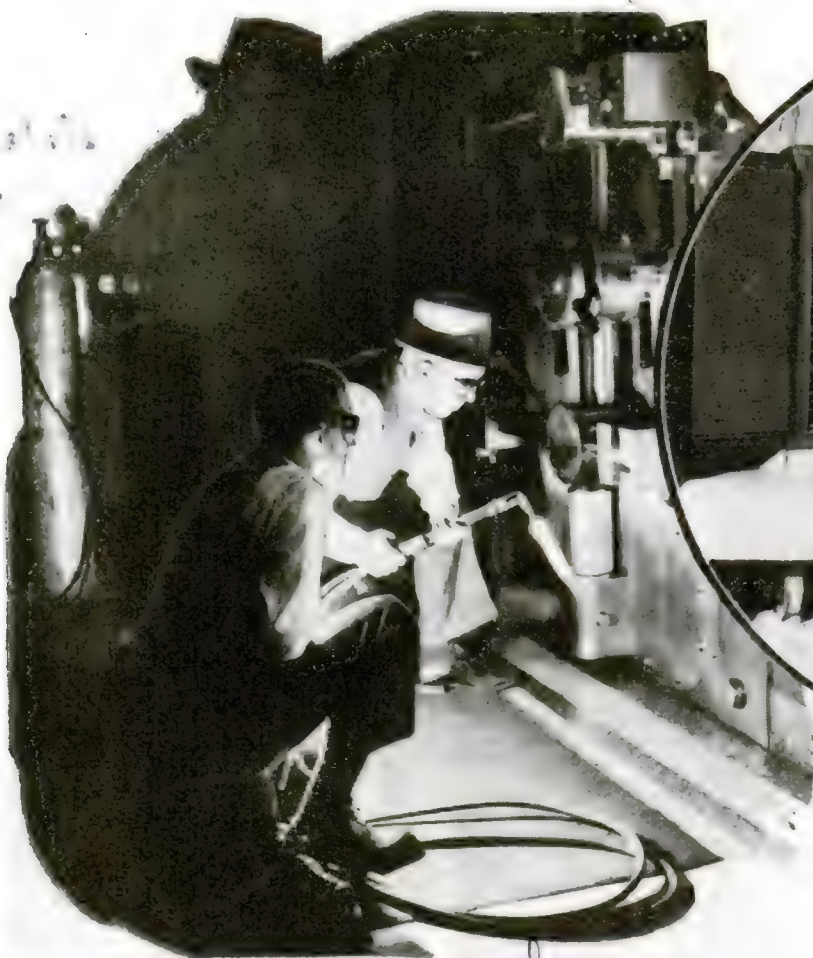
Holder to Help Mark Books Attached to Table

Adjustable to books of any size, a handy holder is an aid in marking of books. It may be attached to table or similar surface and adjusted up or down, in or out. The book is held in natural position for marking the back.



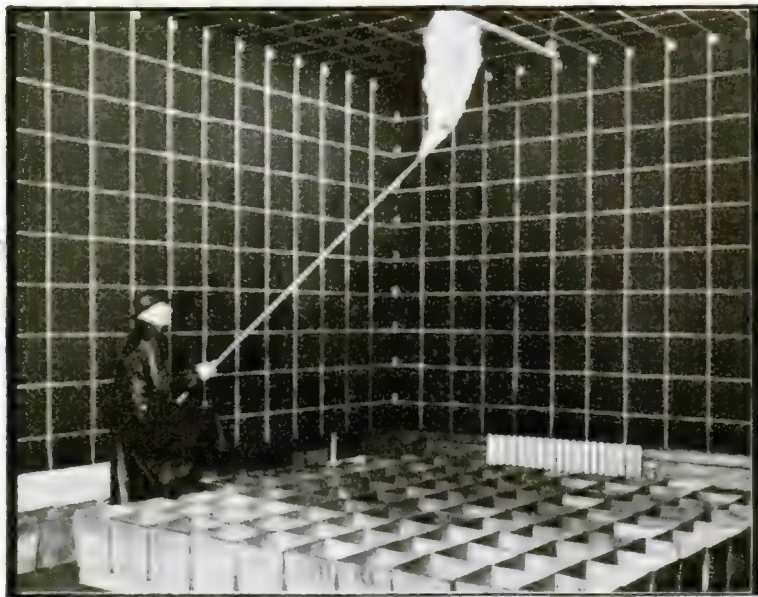
The Book Specialty
Paris, France

Es 36 7



Top, determining how long a vault will resist attack by burglars, and preparing "fireproof" safe for test in gas furnace. Below, torch sets off sprinkler and resultant spray is measured on walls and in buckets

Torture CHAMBERS



to turn off the oven or disconnect the iron will you come home to find the house a heap of ashes?

A Kalamazoo, Mich., woman boarded a train for Chicago the other day and, thirty miles on her way, remembered the curling iron. Agghast, she knew it was connected and supposed her home was by now a mass of flames. As the train roared through a town fifty miles out she tossed a note to the station agent. He rushed to the wire and dispatched a telegram to Kalamazoo. Firemen broke into her house, found a hot iron, smoke, but no flames.

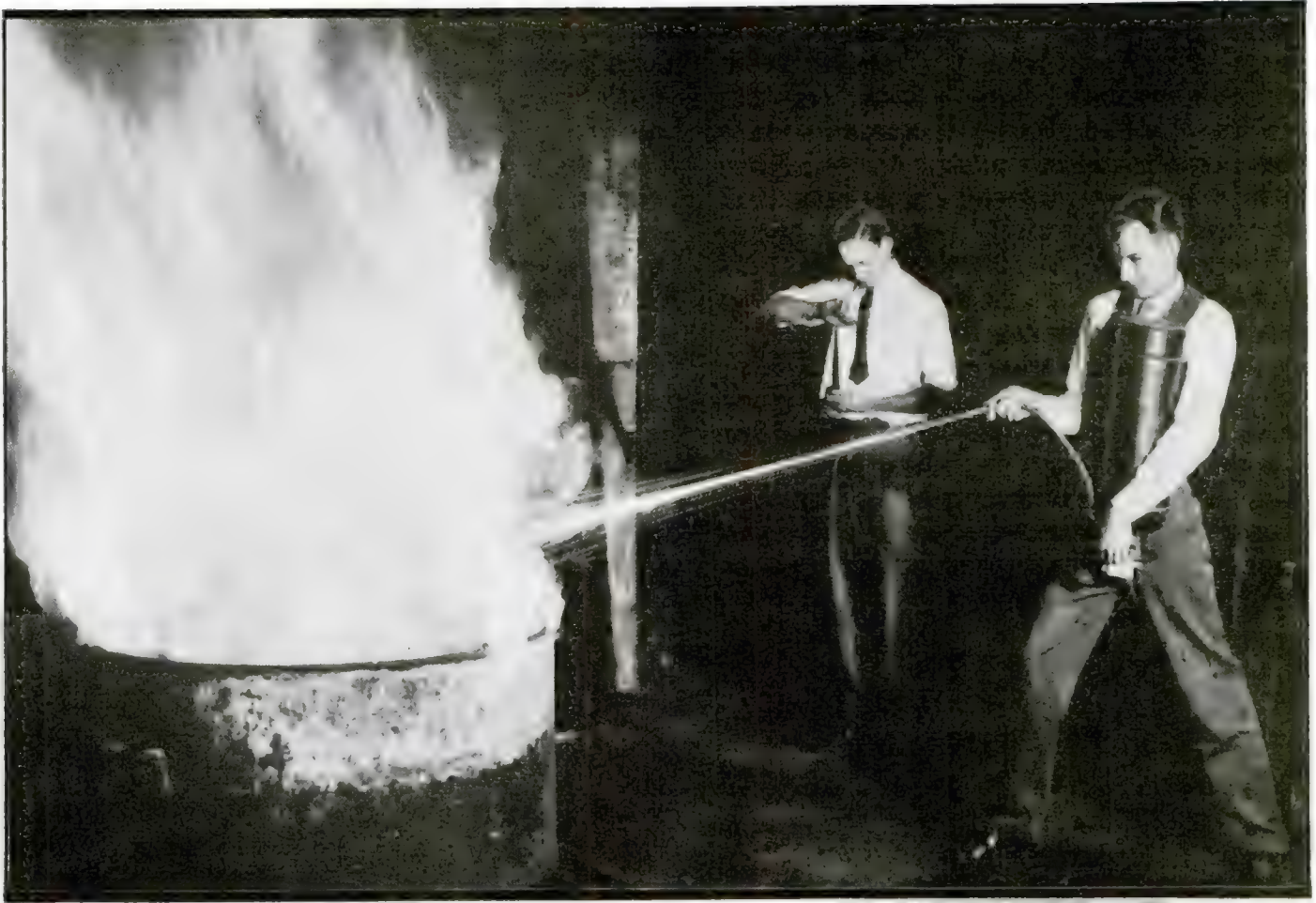
PICKING up a microphone recently, an announcer touched it to his lips and dropped dead. Leaking current had killed him.

How do you know your home is not full of such perils? Can you tinker with that radio set in perfect safety? If you forget

Maybe it was just luck; but if that curling iron wore the "approved" label of the Underwriters' Laboratories, she might have known it would be all right. Before they approve an iron, the Underwriters' men try every trick they know to make it start a fire. They set it on cloth, rest it on

161-6th Ave New York
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also in San Francisco



for SAFETY

a pine board, and let it get plenty hot. It may burn its way right through the board. That's permissible. But it can only char. It must not start a flame. For more than forty years these engineers have been inventing ingenious tortures to protect you, your car, your home, your valuables from fire, shock, accident and theft. Take your oil burner. If you were to come home from a winter vacation and start a fire, would it be likely to blow up? Not if it has gone unscathed through the Underwriters' torture chamber for oil burners. In earlier days, faulty ignition systems were a hazard. Your furnace might become choked with an explosive mixture of oil vapor and air, and then a tardy spark would touch it off. Today ninety-one per cent of the oil burners on the market are approved, and here is what they went through first: for 180 hours the burner was operated intermittently in the laboratory, ten minutes on and ten minutes off; then it burned continuously for seven hours



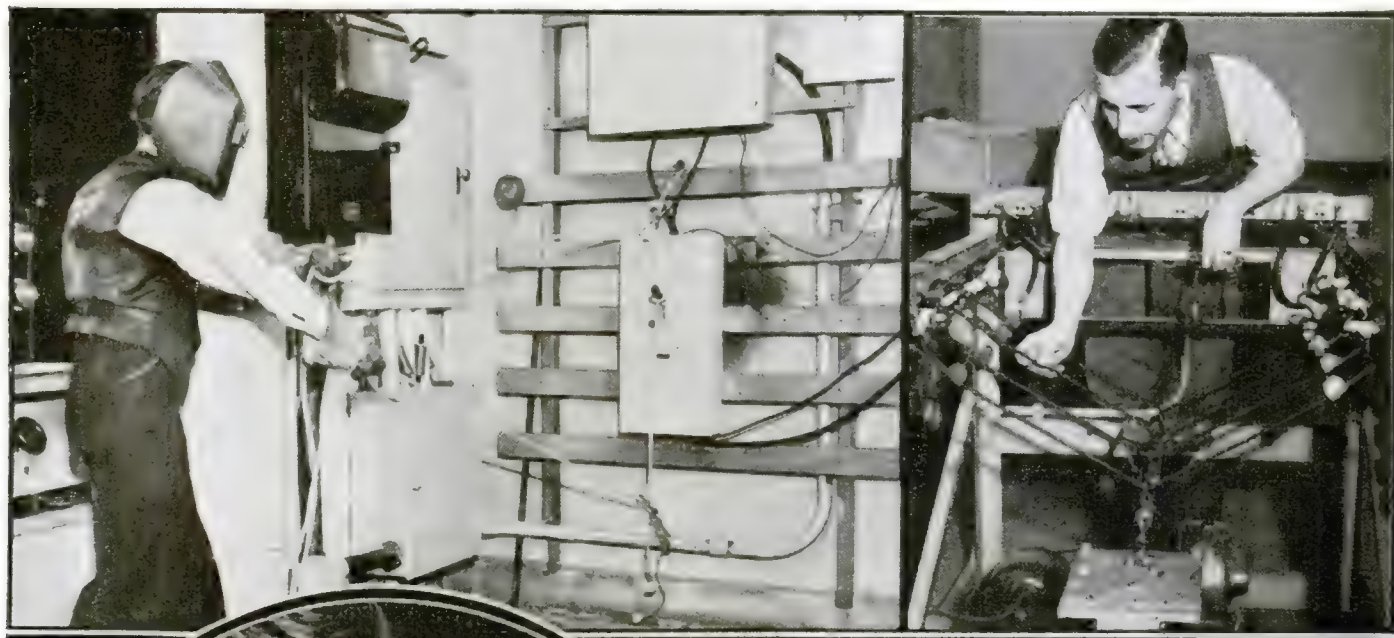
Stop watch checks up the efficiency of fire extinguisher in quenching tubful of blazing gasoline. Below, bullet-resistant glass is tested in target range

on five successive days; then it was fed fuel oil chilled to thirty degrees Fahrenheit, while the ignition system received only seventy per cent of normal voltage. Automatic controls and every moving part took an endurance test of 100,000 operations, and had to be in good working order at the end.

The first time you went to bed with an electric heating pad under your ailing back you probably lay awake expecting to be shocked or burned to death. If your heating pad is "U.L." approved you can rest assured, for a pad like it has been bent back and forth in a 500-hour flexing test, bundled in blankets and given the maximum heating current in an effort to set

the blankets afire, its thermostat has been operated on and off 100,000 times, and plugs, switches, cords, heating element and fabric have been inspected.

Before the cord on your waffle iron or electric heater was rated safe, it endured ingenious abuse. Carrying normal current, the cord was twisted and untwisted 3,000 to 10,000 times by a mechanical torturer. If wire or insulation gave way, it went back to the manufacturer. Rubber insulation is taken from wires, analyzed, tested for flame-retardant qualities, aged in oxygen "bombs" of steel in a bomb-proof room built like a maze to protect the engineers, and finally stretched to the breaking point while its tensile strength is



Left, above, engineer takes no chances in testing high-voltage switch. Right, electric-heater cord is twisted thousands of times by this machine to prove it safe. Below, charring cloth with electric heater

measured. One versatile machine pulls light cords, punches and twists a half dozen different types of electric switch buttons simultaneously for 6,000 operations.

The other day a manufacturer wanted to know how a glass brick wall would stand up in a fire. Would it explode, melt, or collapse? They built a ten-by-twelve foot glass wall in the Chicago laboratories, let the mortar age for a month and rolled the wall up to a gas furnace. Torches lighted the gas ports. In five min-

utes the inside of the glass bricks was heated to 1,000 degrees Fahrenheit. The glass crackled merrily with sudden expansion. They turned on more gas. Thermocouples at five points of the outer wall gave continuous readings of the temperature. Engineers measured the wall's sag every few minutes. The outer wall became red hot, molten plaster oozed out and plopped on the floor; still the wall stood. Through mica windows in the furnace the engineers saw the inner surface of the glass wall bulging like a toasting marshmallow,



Engineer at top is examining electric refrigerator. Below, administering flexing ordeal to heating pad and giving auto tail-light endurance test

finally dripping like molasses. After forty-five minutes the gas ports were closed and the glass wall, now at 1,640 degrees, was rolled out and immediately drenched with a fire hose. Sizzling, crackling, that wall took its punishment standing. When the hose was withdrawn after playing over the red-hot glass for a full minute, the wall was still erect, about one-fourth of its bricks punctured by the powerful stream. The manufacturer was satisfied the wall would be an effective barrier to fire.

That was but one of the everyday "stunts" performed in the Underwriters' Laboratories to make life safer. They devise standard tests for fire-fighting equipment, inspect building materials for fire resistance, examine anything a manufacturer submits for its hazards to life, and provide inspection service for protection against burglary, theft or robbery.

In that same gas furnace, pre-heated to 2,000 degrees, the engineers thrust a 3,000-

(Continued to page 116A)

569.

Movie Camera Dolly Travels on Wood Rails

Movie 'Vee Willie Weenie'



Wood rails at left provide a smooth, silent track for the camera dolly as it follows the action of soldiers marching in a sequence on California movie lot. Several hundred feet of rails were laid

To smooth the way for the camera "dolly" following action on the movie lot, a camera crew devised a wooden track on which the dolly traveled. Several hun-

dred feet of wooden rails were laid for one long sequence of marching soldiers. The dolly rolled smoothly and silently over irregular ground while the filming went on.

591

"Ignitron Gun" Stops Bullets for Observation in Flight

Flashing an intense light when a moving object passes in front of it, an "ignitron gun" makes it possible to "stop" ac-

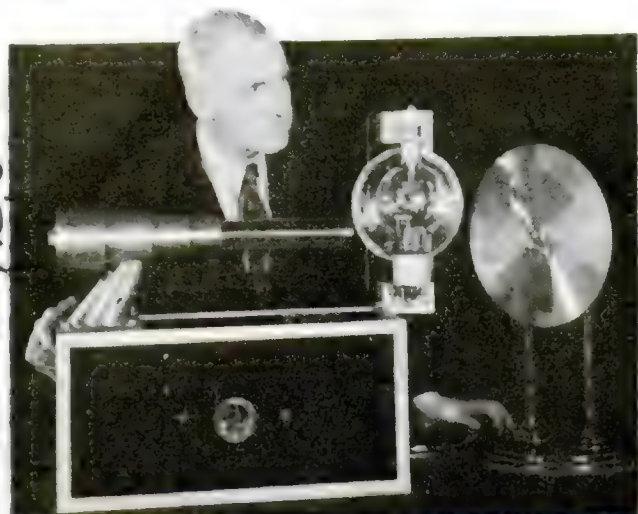
tion too swift for human eyes. This gun is really a mercury vapor tube. Its swift, intense light momentarily illumines a bullet so that observers may study it in flight, or "stops" sand shot from a sandblasting nozzle, or spray from a metallic coating spray gun, or the explosion of a wire from an electric overload.

574

Fire Extinguisher in Prowl Car Beats Firemen to Scene

Listening to alarms on their two-way radio, police squads in Schenectady's "prowl cars" sometimes beat the fire department to fires. So they have been equipped with fire extinguishers, and each prowl car carries a squad trained to fight the fire if they get there first.

From News Bureau General Electric Co



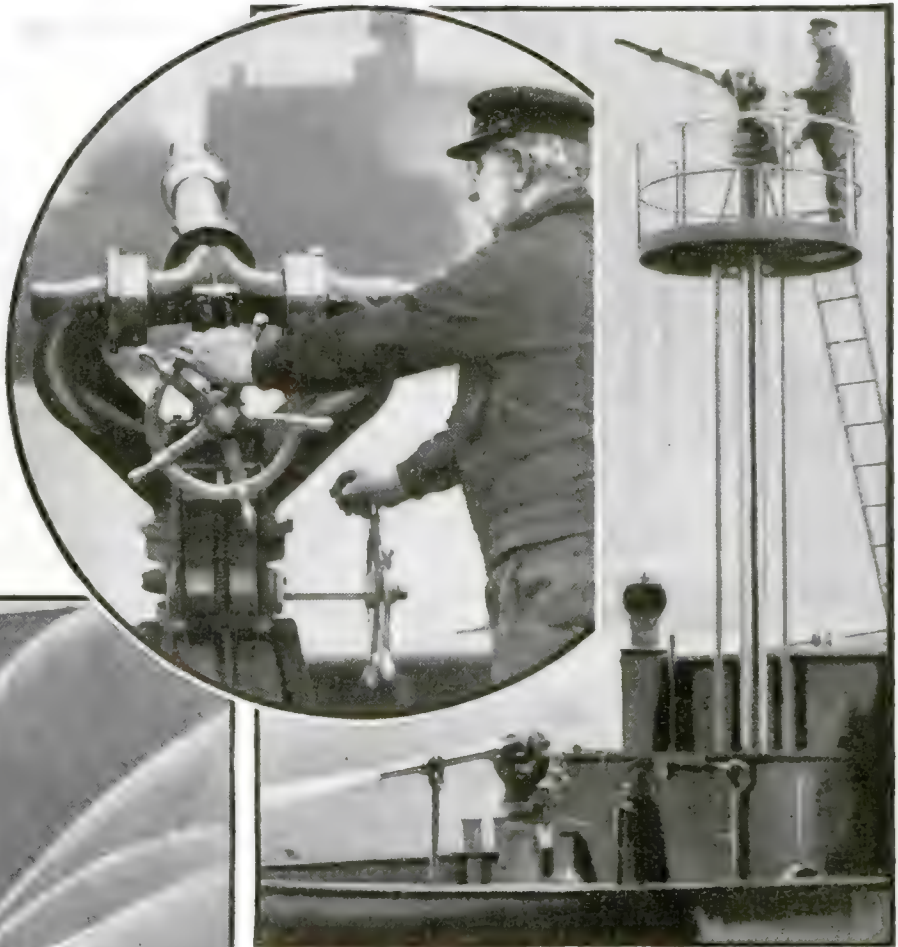
Mercury vapor "ignitron gun" set up to catch action of bullet in flight with its swift, intense light

Westinghouse Electric & Mfg Co
East Pittsburgh Pa

Is 511

Diesel Fire Boat Shoots Seventeen Streams

Equipped with five main Diesel engines, the latest fire-fighting boat can throw seventeen streams of water. Three engines drive the craft, but only one can propel the boat while the other two are used for pumping. Two other engines are only for pumping. Four ten-inch centrifugal pumps supply water to the various connections. The boat has a fire tower which is raised and low-



Three views of new fire-fighting boat. Left, more than a dozen streams of water at once. Center, controls for one of the nozzles. Right, tower which may be raised or lowered hydraulically in a few seconds

ered hydraulically in a few seconds. In raised position, with a three-inch nozzle the tower produces 4,600 gallons of water per minute at a pressure of 300 pounds. Four deck turrets, twelve hose valves and the tower supply the seventeen streams at the same time, totaling 10,000 gallons per minute. Deck turrets, fitted with three-inch nozzles, throw a stream 450 feet. The fire boat is all steel. It has little superstructure and can pass under low bridges.

Is 532 Non-Heating Microscope Lamp Gives Bright Light

Heat is scarcely perceptible when a new low-wattage microscope lamp is used for laboratory work. A pair of matched reflectors give the lamp its efficiency. The reflectors are combined in such a manner that a very clear, brilliant spot of light is cast upon any ob-

Calab.

ject seven and five-eighths inches from the large reflector, giving ample working space. Light for transmission through a compound microscope is taken from a disk of celluloid with ground surface on which the spot of light is thrown. Intensity is sufficient for high magnification with oil immersion objectives. The lamp uses a standard bulb and operates on 110 volts, alternating current, through a self-contained transformer.



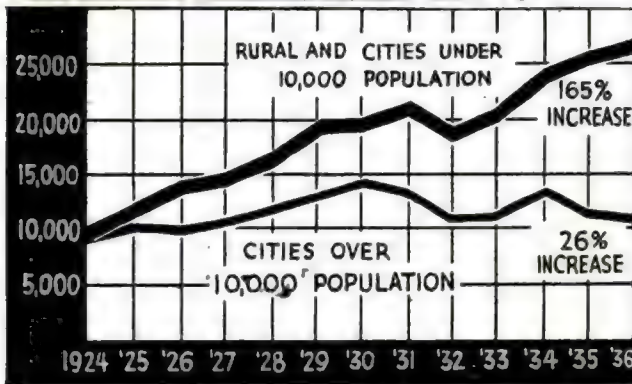
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California Laboratory
Supply Co 928
Central Bldg. Los Angeles

CAUTION!



Some driving mistakes to avoid, and chart showing how motor-vehicle deaths on open road are increasing



By H. W. Magee

THERE'S danger ahead if you drive a car carelessly and here's why.

Traffic accidents will kill or injure more than 20,000,000 persons in this country and cause an economic loss of about \$25,000,000,000 within the next fifteen years unless we do more to promote highway safety than we have yet done.

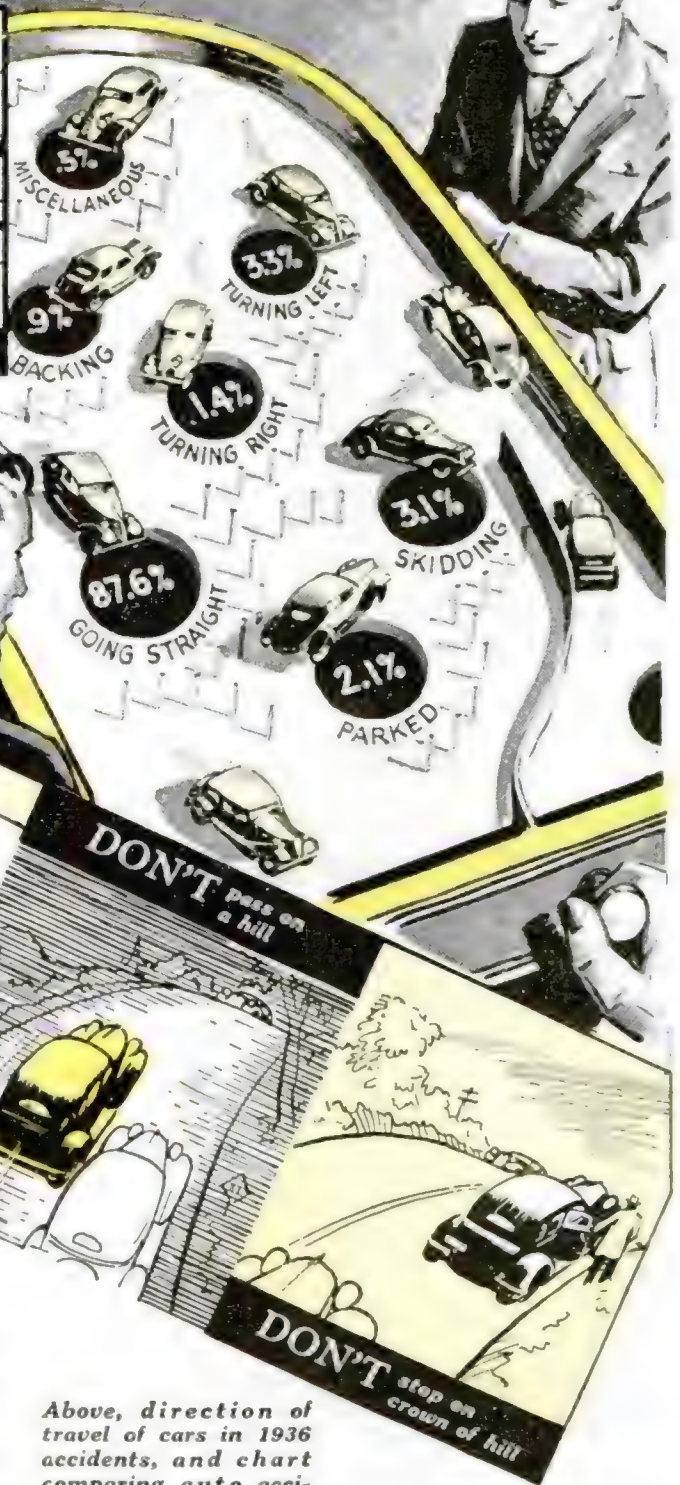
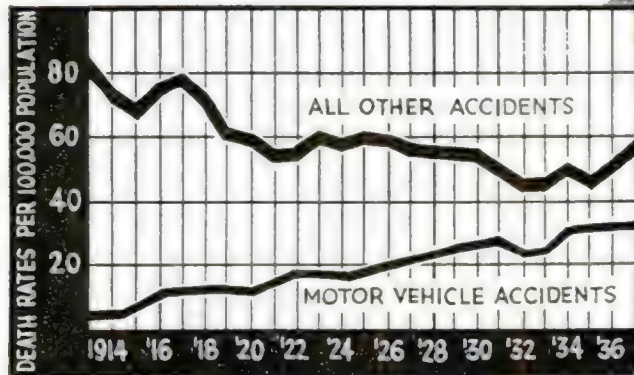
Simple arithmetic proves the tragic truth of this seemingly incredible statement. In

1936 traffic accidents caused about 37,500 fatalities, 110,000 permanently disabling injuries, 1,230,000 temporary disabilities and an economic loss estimated at \$1,660,000,000. Each year the figures are growing bigger but if, by some miracle, they can be held stationary through 1951, it's easy to compute the terrifying totals. And here they are:—

More than half a million fatalities—including thousands yet unborn—1,650,000 disabled for life, 18,450,000 temporarily disabled! That's like wiping out the population of Wyoming, Nevada and Delaware, injuring for life all the people of Vermont, New Mexico, Idaho and Arizona, and temporarily disabling everyone in New York and California.

That's more than six deaths and injuries per mile of highway, one death or injury for each two drivers, almost one for each car on the road today! Virtually one person out of six marked for death or injury by 1951 or before! Plus an economic loss of \$24,900,000,000!

DANGER AHEAD!



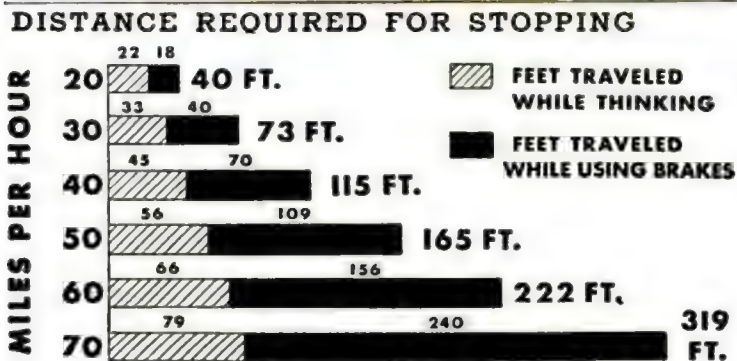
These figures prove that the problem created by scrambling together 27,-000,000 cars, 40,000,000 drivers, 3,000,000 miles of roads and millions of pedestrians is your own personal problem. Your stake in it is high, for it is your very life and limb. If the traffic situation grows no worse than it is, you, as a driver, have better than an even chance, under the law of averages, of killing or injuring yourself or someone else within the next few years.

While organized traffic safety efforts have accomplished much, the fact that the highway toll still increases indicates that this problem does not yield readily to wholesale solution. Keeping yourself from killing or being killed in a traffic accident today is pretty much an individual prob-

Above, direction of travel of cars in 1936 accidents, and chart comparing auto accidents and other types

lem. The best way to avoid driving into a tragedy is to make your own driving "accident proof," rather than rely on a law or some other safety measure to protect you.

Five or six mistakes account for most accidents and a study of the common errors which landed most 1936 traffic accident victims in the hospital or morgue is an excellent way to avoid making the same



mistakes yourself. In the first place, every accident is the result of a mistake by someone. Perhaps the pedestrian is at fault, or the man who planned the road, or the engineer who designed the car. But the statistics show that in about three cases out of five, it's the man behind the wheel who makes the blunder.

And too much speed was blunder No. 1 among drivers who had accidents resulting in deaths or injuries in 1936. Not

speeds of seventy or eighty miles an hour, either, for most cars involved in accidents were traveling less than fifty. This brings up the question: How fast is too fast?

That depends on the condition of the road, the weather, the time of day, the amount of other traffic. But here's a tip from the accident statistics that ought to help. Nearly one-third of those killed last year and more than one-fifth of those injured were killed or hurt by cars which were exceeding the speed limit. Almost nine out of each ten cars involved in accidents were going straight ahead when disaster overtook them—and that's the only direction in which drivers can really step on the gas.

Would you dare top the crest of a hill and go down the other side at fifty miles an hour—with your eyes shut? Certainly not. But you might as well have them shut if you can't see over the crest. Probably there won't be anything there, but suppose there's a steer or a stalled truck?

So you're driving too fast—speeding—when you can't stop within the distance you can see ahead because then you're driving "blind." And this brings up the problem of night driving. Only one-fifth or one-fourth of all traffic is at night, but more than half of all fatal accidents occur after dark. Deaths from night accidents increased more than one-third from 1930 to 1935, while deaths from daylight crashes decreased. And in nearly every report of

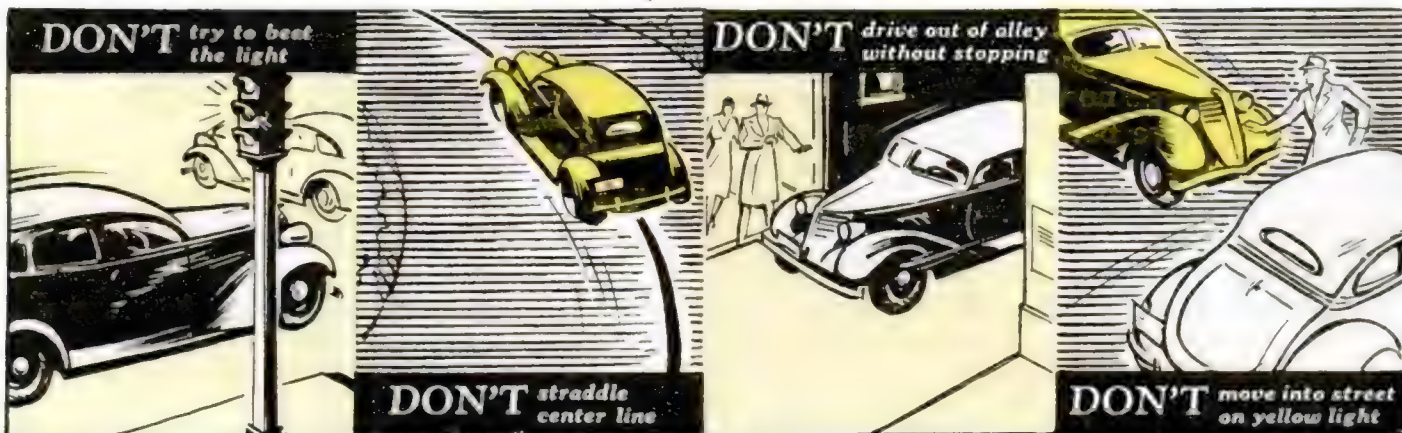


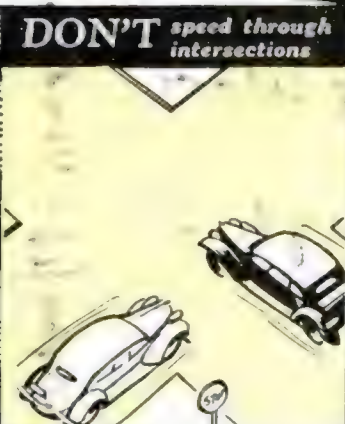
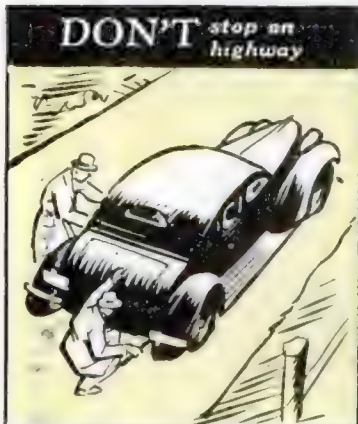
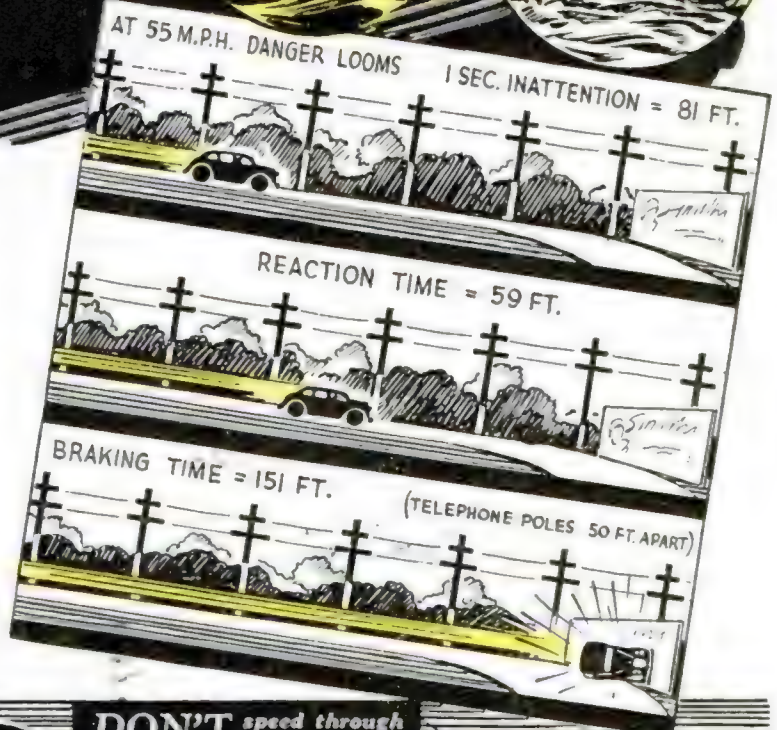
Chart above shows how distance required for stopping increases as the speed mounts. Note difference between sixty and seventy miles an hour

a night accident, there is evidence that someone drove faster than his eyes could see. Fifteen miles an hour may be too fast on a foggy night; fifty is likely to be too fast most any night unless your headlights can penetrate the darkness for 250 feet or more.

Courtesy, consideration for the other fellow, observing the rules of the road—all these pay you big dividends by keeping you out of accidents. To prove it, consider the inconsiderate drivers who disregarded such things and came to grief in 1936. When you decide to take a chance—cross the center line, steal the right of way, crowd in, pass a standing streetcar, pass on a curve or hill or on the wrong side or neglect to signal—just remember that more than 250,000 accidents causing deaths and injuries in 1936 resulted from exactly such practices.

If you know what you are most likely to hit, you ought to be able to exercise extra care in the presence of such objects. Cars and pedestrians are your big hazards. Of accidents resulting in deaths and injuries in 1936, nearly one-half involved collisions with au-

(Continued to page 127A)



At fifty-five miles an hour, above, you travel more than eighty feet a second, almost sixty feet while you react, and you need 150 feet more to stop

Horse Rides Flying Platform in Thrilling Circus Feature



Trained horse stands quietly amid the flash and crack of fireworks while a captive balloon lifts his platform to roof of circus arena

Standing quietly amid popping fire-crackers and a glare of spotlights, a circus horse rides a flying platform in a feature act of a show in Germany. A balloon lifts the aerial horse to the ceiling of the arena while guy ropes steady the platform.

Freezing Cleans Raw Wool

of Burs, Dirt, Grease
Process Co. 10 High St.
Burs, thistles, grease and vegetable matter are literally frozen out of raw wool by passing it through a cold room in which the temperature is thirty to fifty degrees below zero. The low temperature freezes solid the burs and grease on the wool. When the frozen wool is beaten or shaken, the dirt and impurities drop away. About

Perfected by Lowell.
Textile Institute
Lowell, Mass

1,500 pounds of wool an hour can be cleaned by this process, which is being used by some wool mills. Discovery of the process, which leaves the wool whiter, fluffier, stronger and more receptive to dye than that cleaned by more expensive methods, was made at a picnic. Dry Ice, in which ice cream for the picnic had been packed, was thrown accidentally on a wool blanket spread on the grass. When the discoverer shook the blanket later, vegetable matter frozen to it dropped off like icicles. Wool can be cleaned in this manner at a cost of about four-tenths of a cent per pound.

Music Typewriter Prints Staff and Notes

On blank paper the latest music typewriter prints the five-line staff according to requirements, then notes, clefs, signatures, rests, straight and slanting bars and

other characters. Pressing a key rotates the roller, eliminating hand operation.



Latest music writing machine types the staff and all characters necessary

Notodtyn Windstatter
to sub. H. Lutzowstr.
112 Berlin W-3

Robert M. Greenleaf
Los Angeles
Calif

High Voltage
Los Angeles
Calif

Chaitonmarchene
Los Angeles
Calif

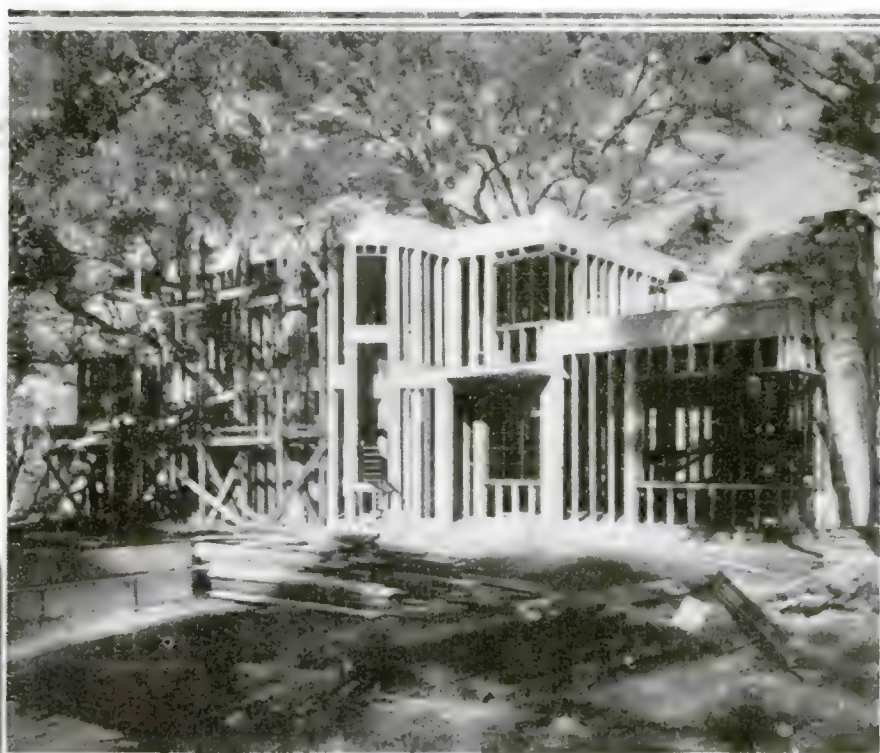
Die
Pindamstr 63

Science Service
68737

Notodtyn Windstatter

Small House Is "Framed" in Light Concrete

Small houses framed in lightweight concrete much as a wood-frame house is built are the latest development in home construction. Light, durable, proof against fire and termites, and free from expansion and contraction, these houses are built of a new type of concrete made of "baked" clay and shale pellets. Instead of the heavier

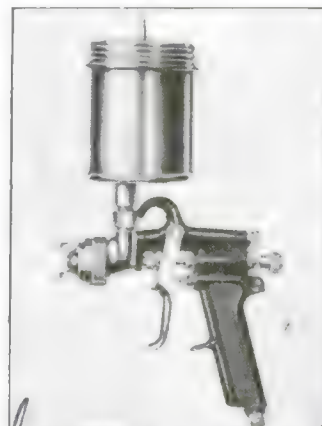


Above, house of lightweight concrete under construction, showing beams and posts of concrete instead of traditional wood framing. At the left is architect's drawing of the completed house. This light concrete is made of cylindrical pellets of clay and shale fired in a kiln

aggregates from sand and gravel beds, the builder mixes clay and shale, slightly moistened, presses it into cylindrical pellets and fires them in a kiln at 2,000 degrees Fahrenheit. The sand is also baked, reducing the grains in weight and expanding them to twice normal. A cubic foot of finished concrete from these materials weighs 100 pounds against 150 pounds for concrete of heavy aggregates. In the small house, supporting beams and posts are of concrete instead of timber, and between them are placed nailing studs to which the outside sheathing, usually stucco, and the inside backing and plaster are attached. Floors, roofs and decks are poured as integral parts of the structure. The upper deck of the San Francisco-Oakland bay bridge is paved with this light concrete.

Spray Gun with Tank on Top Feeds Heavy Materials

With its tank mounted on top, a new spray gun duplicates gravity feed conditions and makes possible the use of spraying materials which cannot pass through the ordinary siphon gun. The equipment has been found adapted to the use of ceramic materials, as well as hammered silver, bronze, and gold-type finishes. The tank holds a pint.



*The Binks Mfg Co.
2114 Carroll Ave
Chicago*

*Gravelite Co. Inc.
111 Sutter St.
San Francisco, Calif.*

518.

es 519

Mr. L. O. Crum Jr.
V. P. Carbide and
Carbon Chemicals Corp

Plane Is Guided to Exact Landing by Radio Compass System

to right or left. With the aid of this equipment the pilot flying "blind" is enabled to set his plane down on the rear end and center of the runway he is to use.



Plane with antenna above and below cockpit. Inset, top, indicator on dash. Bottom, area covered by the guide beams

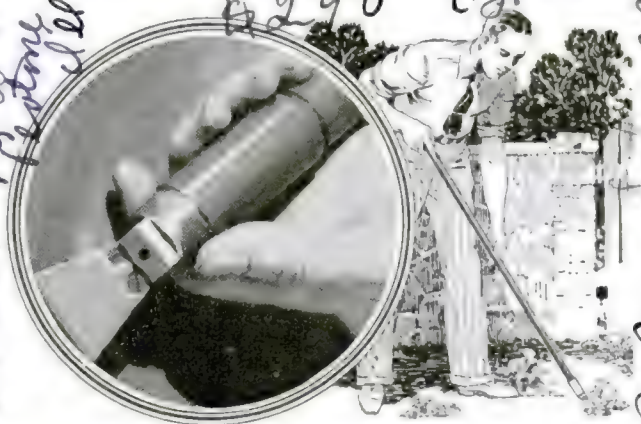
Already in use in Europe, the Lorenz radio compass has just been introduced in the United States as a means of guiding airplanes to exact landings. The first plane equipped with the compass in this country has a staff antenna on its cabin and a horizontal antenna under the cockpit. The first is used when the pilot prepares to land, the other when he desires to pick up signals while approaching the field. As a pilot, who has been guided throughout his flight by an ordinary radio compass, reaches a point where he should begin descending to land, he watches a dial on his instrument panel. The dial has circles marked "O" and "D," which have points of light in them. As the plane passes into the range of the landing guide, the point of light in "D" circle breaks into a series of dashes. When the range of an inner marker beacon is reached the circle "O" shows a series of dots. An indicator between the two shows whether the pilot is descending at the proper angle, and an arrow below it shows whether he is veering

Homes Built of Plastics Promise Lower Costs

Houses of the future will be built of plastic and synthetic materials that should outlast materials used today, industrial chemists predict. From new applications of plastic materials, lacquers and synthetic fibers, new types of homes will emerge, with building costs much lower. Such houses would be noiseless, sanitary and proof against fire, vermin and weather.

Weed Cutter Sheds Poison on Root of Plant

Double death for weeds is dealt out by a farm and garden tool just invented. As the cutting blade is thrust at the root of a weed, it not only cuts the stem but sheds a few drops of gasoline or other plant poison to kill the root. The handle of this weeder carries a pint of gasoline. Merely pressing it into the ground opens



Closeup of weed cutter shows small hole from which gasoline drops when blade cuts root

a valve and lets gasoline drip on the root. Farmers use it to attack Canada thistles and gardeners fight dandelions with it.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

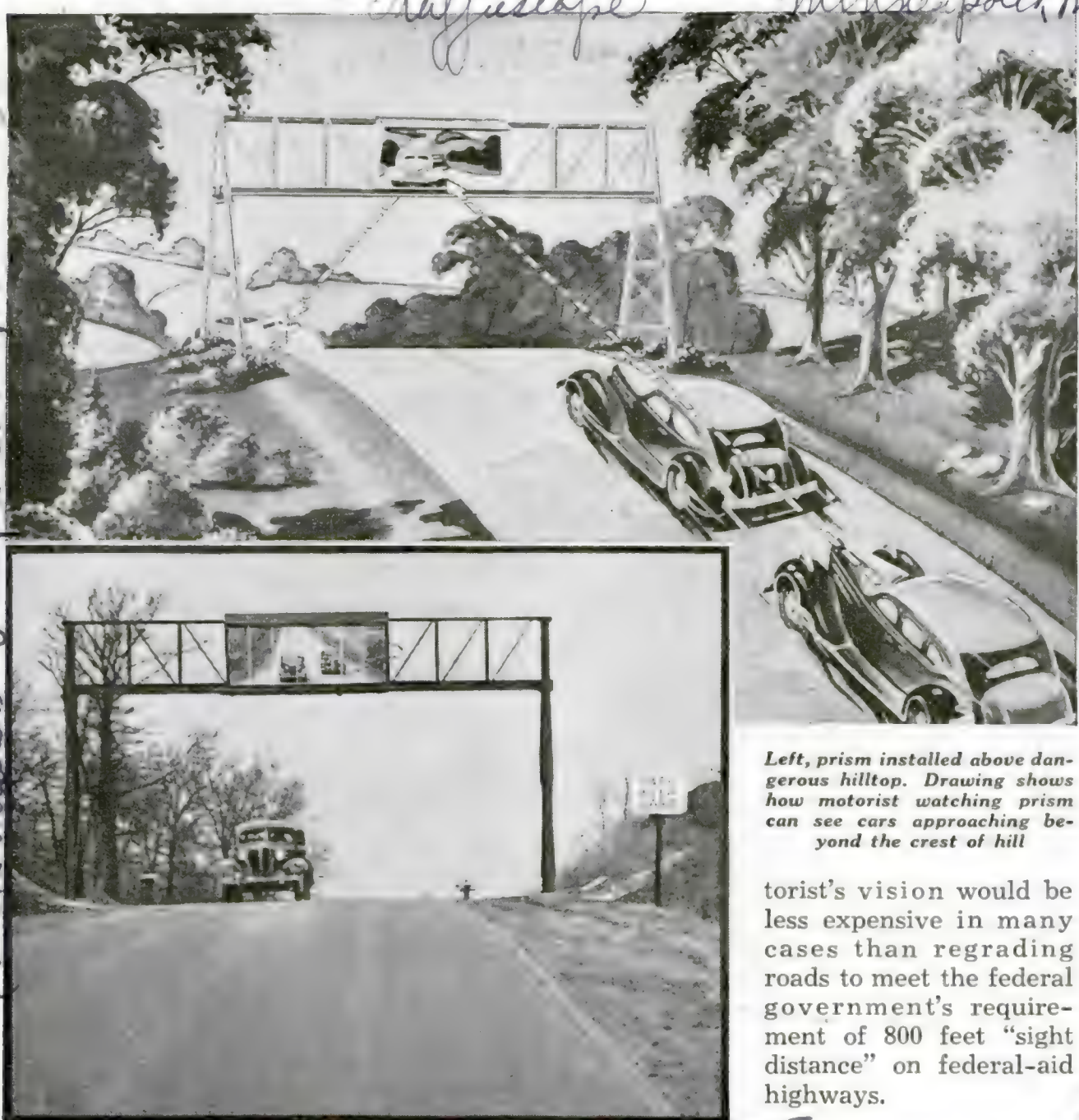
Mr. C. Lorenz, Berlin, Germany, American Radio Telegraph & Telephone Co.

Mr. A. M. Schroeder, Peotone, Ill.

Mr. A. M. Schroeder, Peotone, Ill.

(Home address - Ralph Cooley, 1633 Thomas, St. Paul, Minn.)

Es 502. d.m. Ralph Cooley, Jr. Co.
POPULAR MECHANICS 201
26th floor Rand Bldg
Hilltop Prism Shows Driver the Road Beyond
Traffic-scope Minneapolis, Minn



Left, prism installed above dangerous hilltop. Drawing shows how motorist watching prism can see cars approaching beyond the crest of hill

torist's vision would be less expensive in many cases than regrading roads to meet the federal government's requirement of 800 feet "sight distance" on federal-aid highways.

To prevent hilltop traffic collisions, a highway engineer has invented an overhead prism which gives the motorist a clear view of the road beyond the crest. The prism is made of glass, mounted like an inverted V in a trestle spanning the highway, fifteen to twenty feet above the ground at the top of the hill. The glass frame is filled with glycerin or some similar transparent non-evaporating liquid. A motorist approaching the crest can watch the prism from 2,000 feet away and see cars approaching a half mile on the other side. This method of extending the mo-

Es 555.
Waving Spotlight Sweeps Track in Front of Fast Train

Gyrating in a spectacular figure "8," a powerful headlight installed on a fast train between Chicago and Minneapolis sweeps the track to give distinctive and unmistakable warning of the speed train approaching. Its 3,000,000 candlepower light throws a canary yellow beam which attracts attention three miles away. A motor oscillates the reflector, swinging the beam in wide arcs and striking automobiles approaching the grade crossings.

comb. J. J. Cramer, Chicago
and N.W. A. R.
400 W. Madison, Chicago

4/13

Complete spectrographic assays - \$6.00 each
Mr. John Hermann

HUNTING TREASURE

791 San Julian St Los Angeles

Carl Maxwell Reid Bryant, 541 1/2 S. Lelandale Blvd., Los Angeles, Calif.



Assayer making tests on sample of ore by firing in furnace. Tests are made quickly with the aid of the spectrograph which "fingerprints" all minerals present in the ore

IF YOU'RE planning to explore abandoned mines of the West for overlooked treasures, take science's newest "magic eyes" along. Two or three black boxes about the size of portable typewriters will hold your "black-light" argon bulb, your iron arc, willemite screen, blowtorch, goggles, geologist's hammer, and minor tools for prospecting.

You won't need the old-fashioned burro train piled high with sample bags—a tablespoonful of powdered rock, sealed in an envelope, is enough. Your assayer will use the spectrograph to analyze your findings. Cramming a small pinch of the sample into a cupped crater in an electric arc's carbon electrode, he will start the current flaming across and snap a photograph. Every mineral present will leave its "fin-

gerprints" on the film. The rest is a matter of measuring the position of thin vertical stripes on the negative, made easy by comparison with a master film which has all the minerals showing on it.

An assay used to take days of painstaking work, a big bagful of samples, and cost the customer \$150. Now the job can be done in a few minutes for only six dollars.

A bronzed man in a wide-brimmed hat walked into a western assayer's office the other day, pulled from his pocket a bunch of sealed envelopes, and requested spectrographic analyses of their contents. On his return, he leafed through the assayer's reports and picked out one with a grunt of satisfaction. "Just what I was looking for!" he announced.

The assayer registered surprise.

Brown Carl
226 028 15th
Los Angeles

with expanded scale
Applied Research Laboratory
1240 S Main, L.A.

with MAGIC LIGHT

"Why, I thought you were going to be disappointed. There's no gold in those rocks, nor anything else of commercial value."

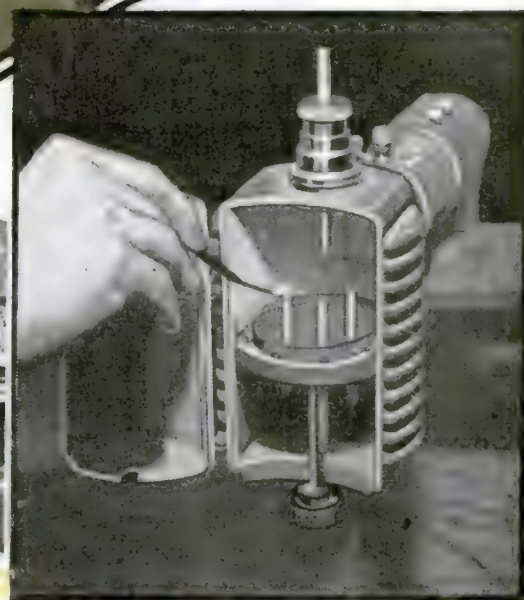
The man smiled. "Cadmium's what I'm looking for, and here it is."

The assayer looked at the report. "Why, the test shows only .0003 per cent—you wouldn't get a dime's worth of cadmium in a ton of ore," he protested.

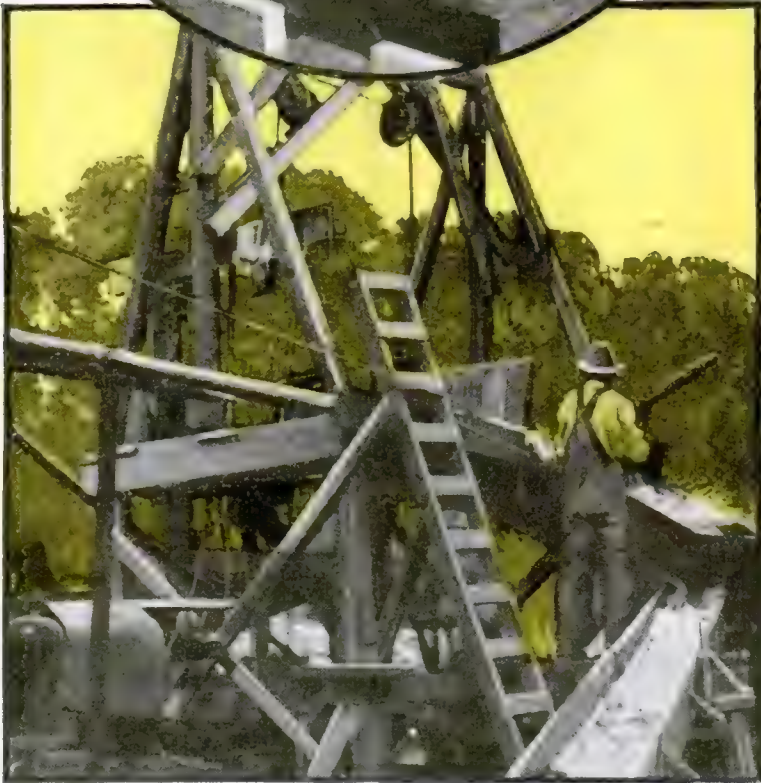
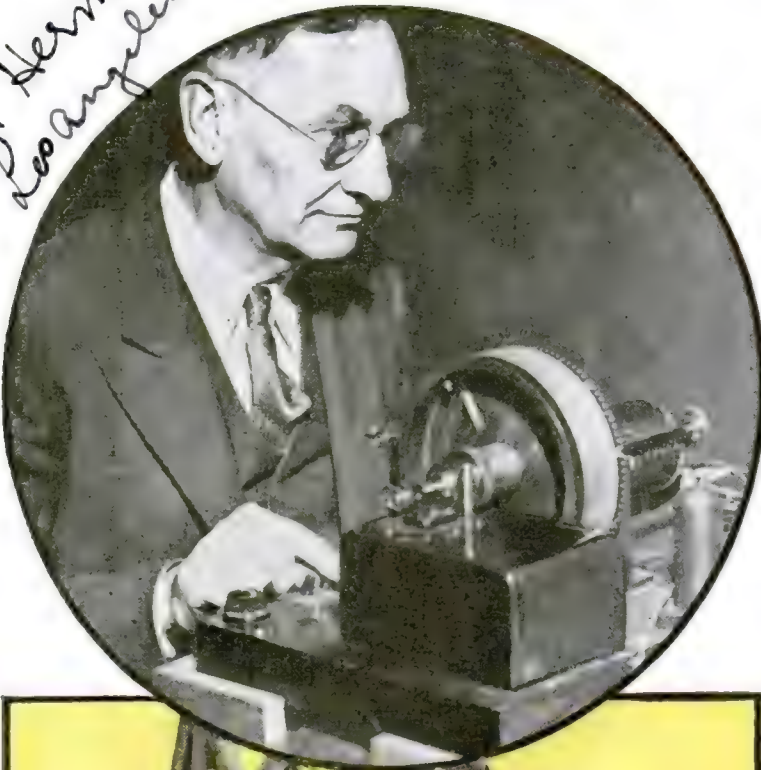
"No," retorted the other, "but gold in our mine runs in a formation streaked with very faint traces of cadmium. Last week we lost the vein and tunneled eighteen feet without finding it. So I took samples along the drift and brought them in for testing. The cadmium showings will lead us straight to the ore body."

Tracing precious ores by such "markers" is now possible because

Right, mercury-vapor lamp tests ore sample with ultraviolet light as goggles protect the eyes. Bottom, left, pulverizing ore samples to be assayed. Right, placing tiny bit of ore in electric arc crater for spectrographic analysis



20415
 Dr. Hermann
 Los Angeles



predictable. A big company drove a tunnel 1,800 feet and found no ore, but later a sharpshooter drifted twenty-six feet farther and hit the bottom of a pocket of ore worth \$40,000. Another miner stopped six inches too soon, and the next man drove his pick straight into a young fortune.

But now magic-light prospecting is enabling a few shrewd prospectors to steal a march on the others. Wise in mining lore and fortified with a few hundred dollars that they are prepared to stake on a long chance, these men are going over the tunnel walls of abandoned, water-filled mines with an eagle eye. It's picking over dry bones, but they take plenty of samples, knowing that the spectrograph will tell them things that the old-fashioned assay never mentioned. A prospector used to rush into the assayer's and demand to be told whether his ore contained any gold. Now his spectrographic report shows not only gold, but twenty-five or thirty other minerals as well, and

the spectrograph can detect tiny amounts of elements that elude delicate chemical tests. A glance at the spectrographic film will show whether the pay ore contains any uncommon material not found in the barren country rock, and from then on, the prospector knows that any sample containing this marker mineral will point the way to the lost vein.

In recent years old diggings have been combed by "sharpshooters" seeking overlooked fortunes. Now and then they struck it rich, for "pockety" formations are un-



Top, polarograph for detecting minerals in liquids. Center, bringing up pay dirt from old mine. Bottom, adjusting iron arc beam to detect minerals

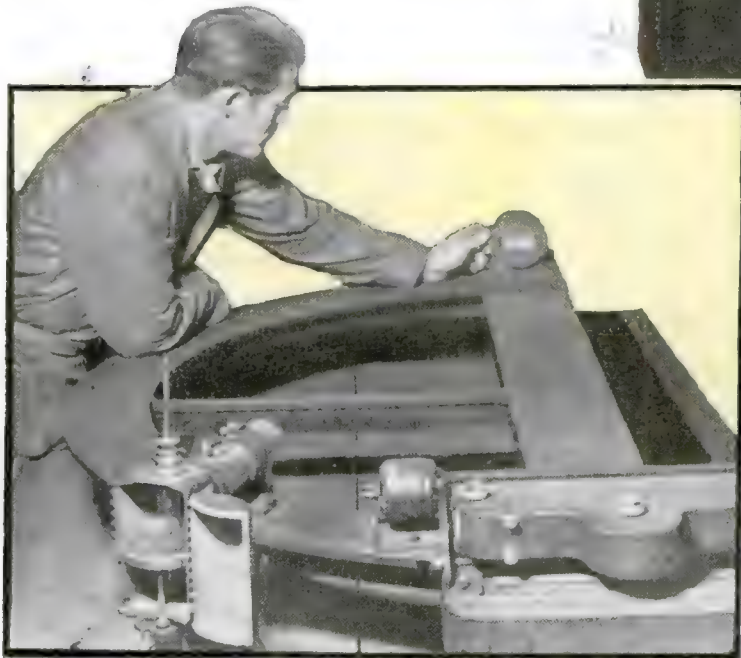
Dr. Otto Muller
 Dept. of Physiology, Stanford
 Univ. Palo Alto, Calif

nowadays in the mining camps you often hear of men who went out looking for gold and found tungsten, or molybdenum, or even carnotite, mother ore of priceless radium.

One miner was electrified when his sample showed a brilliant green line in the spectrum indicating the rare metal thallium, used in special glass and certain alloys. Another found osmium, far more precious than gold.

It's an old saying of mining that erosion does more for prospectors than a million holes dug in the ground. Here is another field being explored by a few prospectors. Running water that eats into a mountainside and exposes hidden veins of ore carries away microscopic traces of the ore. Near the huge copper mines at Bisbee, Ariz., you'll find the run-off waters after each rain betraying tiny quantities of copper salts. Maybe the trace would be as small as one part in a million—but nearer the ore body, this percentage might jump to ten or even a hundred.

A glassful of water, taken from each of a number of likely locations, is the starting point for general search of a region. Turned



Top, strip of film showing elements in ore sample. Center, modern prospectors with magic-light kit. Bottom, adjusting reflecting mirror of spectrograph

over to the polarograph, a supersensitive instrument which uses weak electric currents and galvanometers to analyze liquids, these samples quickly reveal mineral traces and narrow the search to a particular valley or hillside.

Another tool used by the modern prospector is the "black-light" argon bulb, whose invisible ultraviolet rays make certain ores glow like phosphorescent fish or glowworms. By flashing the rays from one of these bulbs, or from a port-

(Continued to page 124A)

George A. Magacher, 568 N. Lower St. Los Angeles

Coast-to-Coast Flying Chart Shows Big Increase in Speed



How coast-to-coast flying has been speeded. In twenty-six years the trip has been cut from fifty-four days to less than sixteen hours

How aviation has advanced in the last twenty-six years is revealed on a chart showing the flying time required for crossing the United States. Weeks, days and hours have been clipped from coast-to-coast journeys year by year, starting from Capt. Galbraith P. Rodgers' fifty-four-day trip in 1911. Today passengers are carried from the Atlantic to the Pacific ocean in slightly more than one-half day. Just recently United Air Lines inaugurated a new Chicago-to-California schedule of eleven hours and fifty-nine minutes, cutting two and one-fourth hours off the old schedule. United's schedule for the east-bound coast-to-coast flight is fifteen and one-third hours. West-bound planes require slightly more than seventeen hours.

Wheeled Dummy Trains Dogs to Lead the Blind

Dogs are being trained to lead the blind by means of an "artificial man," consisting of a light frame about the height and

width of a man, mounted on a pair of wheels. The object is to get the dog accustomed to avoiding obstacles of his own size and also of a man's size. First the dog is given the task of pulling the pair of wheels, to teach him to avoid steps, street-railway tracks and excavations and to choose a path that will not let one of the wheels, representing the blind man's foot, slip into the gutter or strike against walls or posts. Then the full-size dummy is added to teach the dog to pay attention to overhead obstacles, such as low-hanging tree branches, awning poles, wires, ropes and the like. After several collisions affecting the upper framework of the dummy the dog learns to go around, rather than under, obstacles seven feet or less above the ground.

Pedal Controls Solder Flow and Leaves Hands Free



Hands are left free to handle the work when the craftsman uses a new soldering machine equipped with pedal for controlling the flow of solder. The iron is heated by electricity and the feed rollers are adjustable to feed

strip or wire solder from one-sixteenth to three-sixteenths inch. The supply holder carries a roll of wire solder up to twenty-five pounds. A funnel takes away fumes.

American Solder & Flux Co.

*Mr. E. L. Davis, Director
for Environment Research
Hamburg Univ. Germany*

Es 521 Cont. H. J. Wilkins
29 Bean Road
Desley Heath in London Eng

POPULAR MECHANICS

207

Streamline Car Tests Model Plane on Water



High-speed streamline car tows model seaplane in 500-yard test basin near Rome while instruments and observers check its performance in the water. Car is capable of eighty-five miles an hour

Streaking along a track flanking a 500-yard test basin near Rome, Italy, a fast streamline car tows model seaplanes and ship hulls while cameras, dynamometers and other instruments record the performance. To smooth the waves set up during the test, terminal buffers and water-shock absorbers are installed at the tank ends, and these are so effective that testing time can be shortened from an

hour to five minutes. One tow car, capable of traveling eighty-five miles an hour, carries the model on a projecting arm. In another section of the basin the models are linked with an overbridge structure on four wheels attached to a testing car capable of forty-four miles an hour and driven by four electric motors. Every five yards, the force acting on the model in the water is registered in the towing car.

Sixty-Five Ton Anvil Reveals Progress Made in Tools



The old and the new in anvils. Right, sixty-five ton hammer base which is used in the forging of crankshafts for automobiles

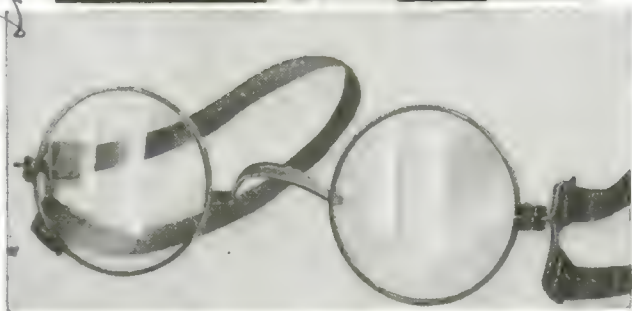
In contrast to the old-fashioned hand anvil on which one workman forges small parts is the sixty-five ton hammer base or anvil installed recently in the Chevrolet plant for the forging of automobile crankshafts. A steam hammer replaces the workman's brawny arm in operation of the giant anvil. The small anvil is located in the gear and axle plant and is used for making conveyor hooks and other small parts.

Motor Division
General Motors Sales
Corp. 420 Milwaukee

Aeronautical Laboratory of University of Rome, Italy
Air Ministry

are different much

Spectacles for Gas Mask Aid Short-Sighted



Bottom, spectacles for use in gas mask. Top, demonstration showing how they fit

Designed especially for use in gas masks, a new type of spectacles eliminates the hazard of having the mask displaced by the frames of the glasses. The new spectacles have soft tapes that lie close to the head instead of rigid side pieces. An anti-fogging fluid keeps the glasses clear when worn with the mask. Thus short-sighted persons may work in comfort and safety, certain that gas cannot enter the mask during peace-time drills or actual warfare.

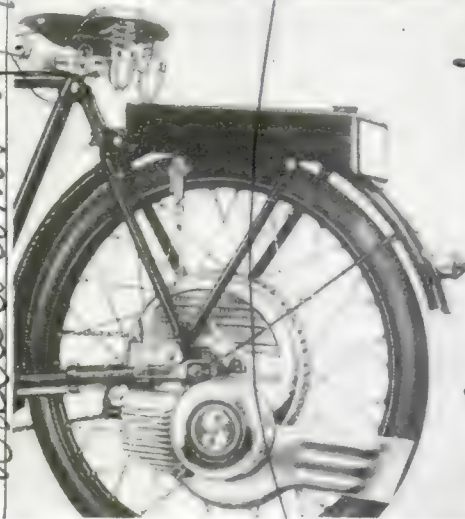
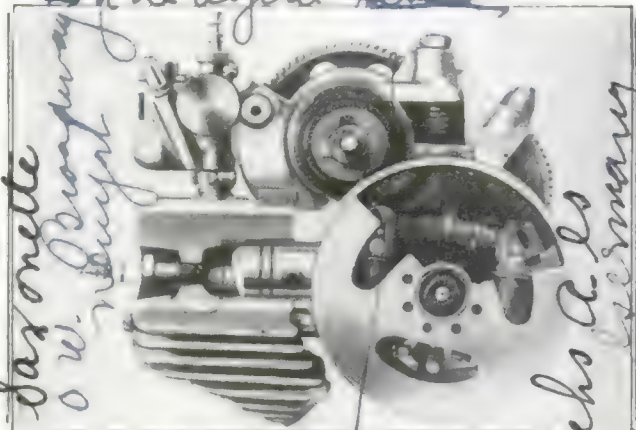
Auto Is Made of Farm Products from Thousands of Acres

Farm crops from thousands of acres every year go into the manufacture of automobiles which, at first glance, appear to be mostly metal. One manufacturer alone, to build a million cars, requires 2,400,000 pounds of linseed oil, from 17,500 acres of flax, for paints, oil, soap and glycerin; a half-million bushels of corn for rubber substitutes, alcohol and solvents; 3,200,000 pounds of wool for upholstery, gaskets,

carpeting and lubricants; 1,500,000 square feet of leather from 30,000 cattle for upholstery and glue; 89,000 pounds of cotton from 558,000 acres for safety glass, brake linings, upholstery and timing gears; 2,000,000 pounds of soybean oil for paint; 350,000 pounds of mohair from 87,500 goats for fabric; 2,500,000 gallons of molasses for solvents, shock-absorber fluids and anti-freeze; and bristles, lard oil and acid from 20,000 hogs.

Motor Installed in Bicycle Hub Revolves around the Axle

Extremely economical in gasoline consumption, a motorized hub for bicycles has been introduced in Germany. The motor itself is stationary. The maximum speed is about twenty miles an hour and it can climb a grade as great as nine per cent without help from the pedals. The single-cylinder, two-stroke motor develops one-half horsepower and is fed by a gravity tank installed over the rear wheel. A metal disk clutch is set up on the hub housing.



Top, one-cylinder bicycle motor. Below, motor installed on rear hub with gas tank over wheel

U.S. agent. Walter

Rainberg, 9408-34th
Road, Jackson Heights, N.Y.

no U.S. agent known

no U.S. agent known
Es. Harris Reelers 47 Wymore St
London W.I. England

From The Parents
Magazine May 1937
P. 110.

Es 542

Es 557
Saxnette
Walter Comberg, 90 W. Broadway
New York

Hochtel and Sachs A.G.
Dachau, Germany
Schweinfurt, N.Y.

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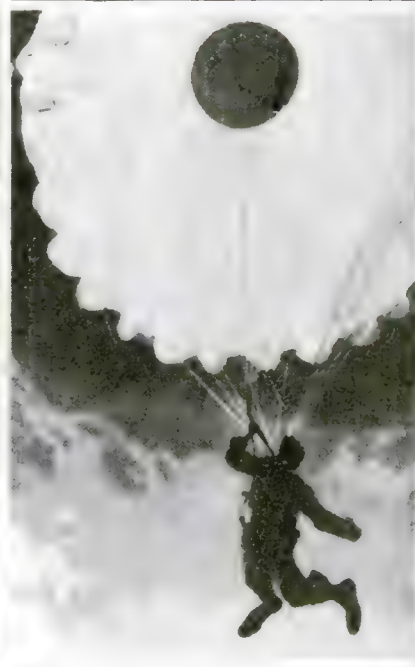
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New York

Fan Forces Parachute to Ascend with Jumper



Several views of parachute ascension. Top, left, 'chute beginning to fill with air from blower. Right, ready for the take-off. Bottom, left, soaring into the air with aid of blast from blower. Right, starting descent

Used in training parachute jumpers in Russia, a blower device forces the parachute upward until the student's weight counteracts the air current. Then the "jumper" descends in the usual manner, working the shroud lines to jockey for a perfect landing. At the beginning of the lesson, the student stands on a grilled platform, his chute attached. A powerful motor-driven fan generates a strong upward current of air, filling the parachute, tightening the harness and lifting the parachutist off his feet. Steadily the 'chute rises toward "ceiling," the point at which the student's weight overcomes the air current's force, and then comes the descent, which is



made as though the student had dropped from an airplane. By eliminating that perilous interval between an actual jump and the opening of the 'chute, the blower reduces the hazard.

Dirt on Plane's Wings Costs Money by Reducing Speed

In operating high-performance airplanes the importance of smooth surface on the wings, as well as other parts, is so great that experts suggest it may be found economical to have the wing surfaces wiped clean of dirt and dust at every stop. Even a small amount of dirt on the wings increases resistance to the air and thus reduces speed, causing the engines to work

harder to maintain the same rate of travel. Reducing the size of rivets in an airplane wing by one thirty-second of an inch makes it possible to reduce the power necessary for operation by 100 horsepower.

¶ Alligators and reptiles in Chicago's Brookfield zoo keep their feet warm by means of heating cables laid in the sand.

Science Service 6/18/37

National Advisory Committee for Aeronautics Langley Field. Va

General Electric People's Schenectady, N.Y.

May 1937

Is 438 Cmt. Mr. Thomas E. Stinson Jr
10555 Holman Ave
Pasadena, Calif
Los Angeles, Calif

Forecasting the WEATHER

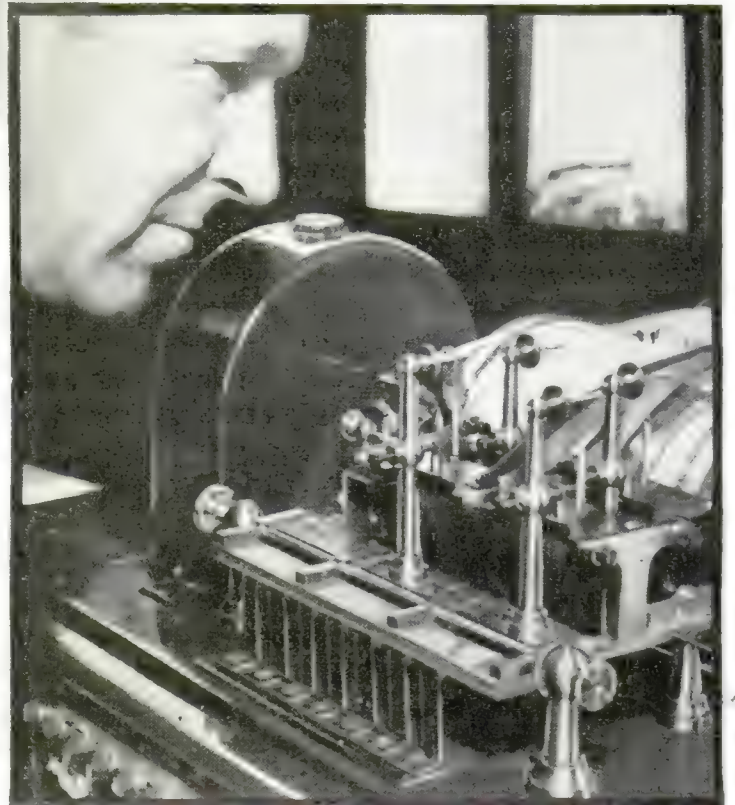


It is too early in the year to predict next winter's weather, although the forces that will control it are being studied already. But the conditions that brought on last winter's floods and unusual conditions were scrutinized as early as last summer. Last October Dr. Irving P. Krick of the California Institute of Technology warned citrus growers that they could expect unusually cold weather and heavy frosts during the winter season. He based his forecast upon a queer shift in what he calls the semi-permanent atmospheric boundaries that control the general climate in the United States.

Normally one of these boundaries lies just east of the Rockies and the other hovers over the Atlantic a few hundred miles at sea. The boundaries mark the limit of the fairly stable cold continental air mass and separate it on both

EVERYONE wants to know what the weather will be like tomorrow. Weather wizards who are developing the science of air-mass analysis can tell you not only that but they can make predictions for the next two or three days that are correct nine times out of ten. Air-mass analysis is contributing amazingly to the accuracy of weather forecasts.

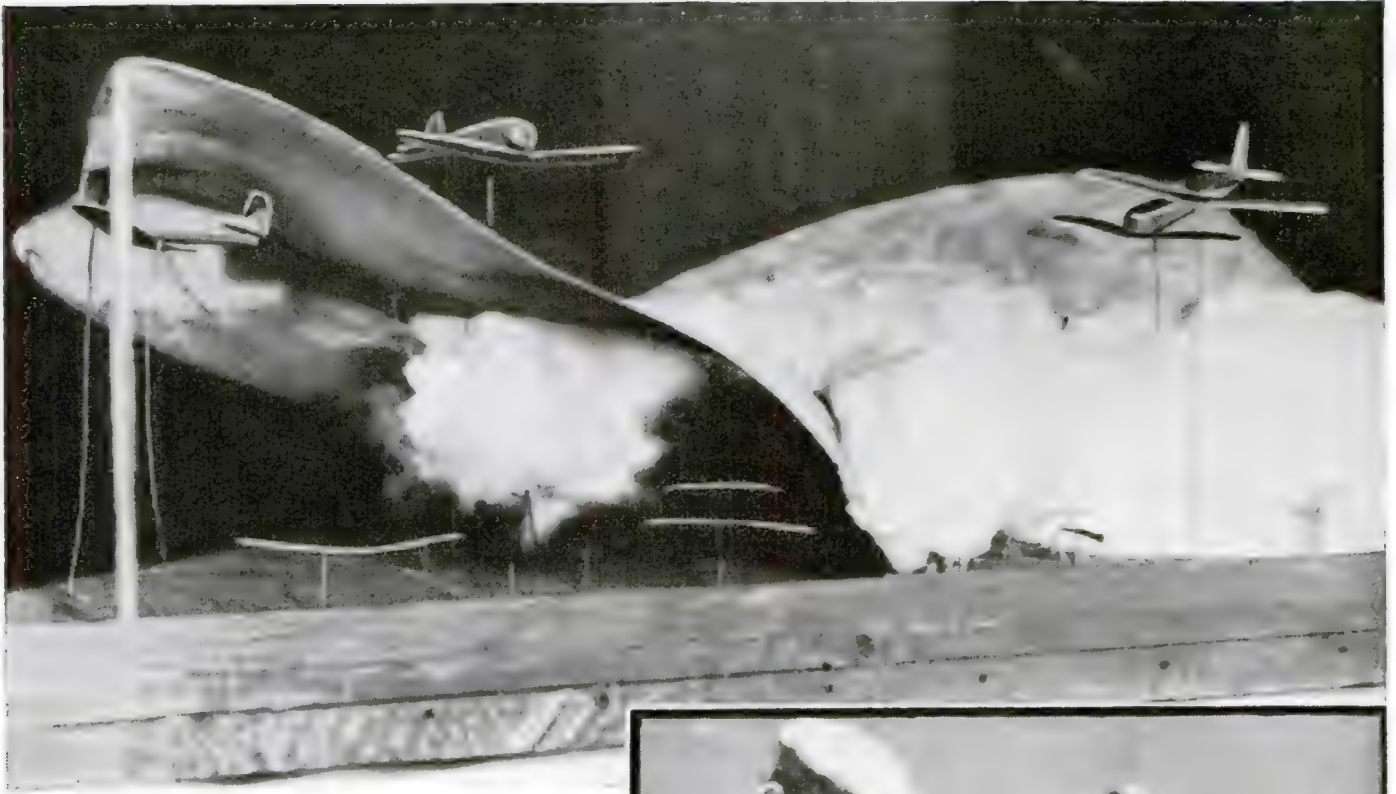
Now there is a possibility that the same science may help to foretell the general climate a whole season in advance. That means that late in the summer, for instance, forecasters will be able to say whether a cold wet winter or a comparatively mild one may be expected. Advance information like that has been a major goal of meteorology for a long time. Such a head start on the weather would mean tremendous savings to industry.



Top, wind vane and air-speed indicator. Bottom, automatic weather recorder

20438

a YEAR AHEAD

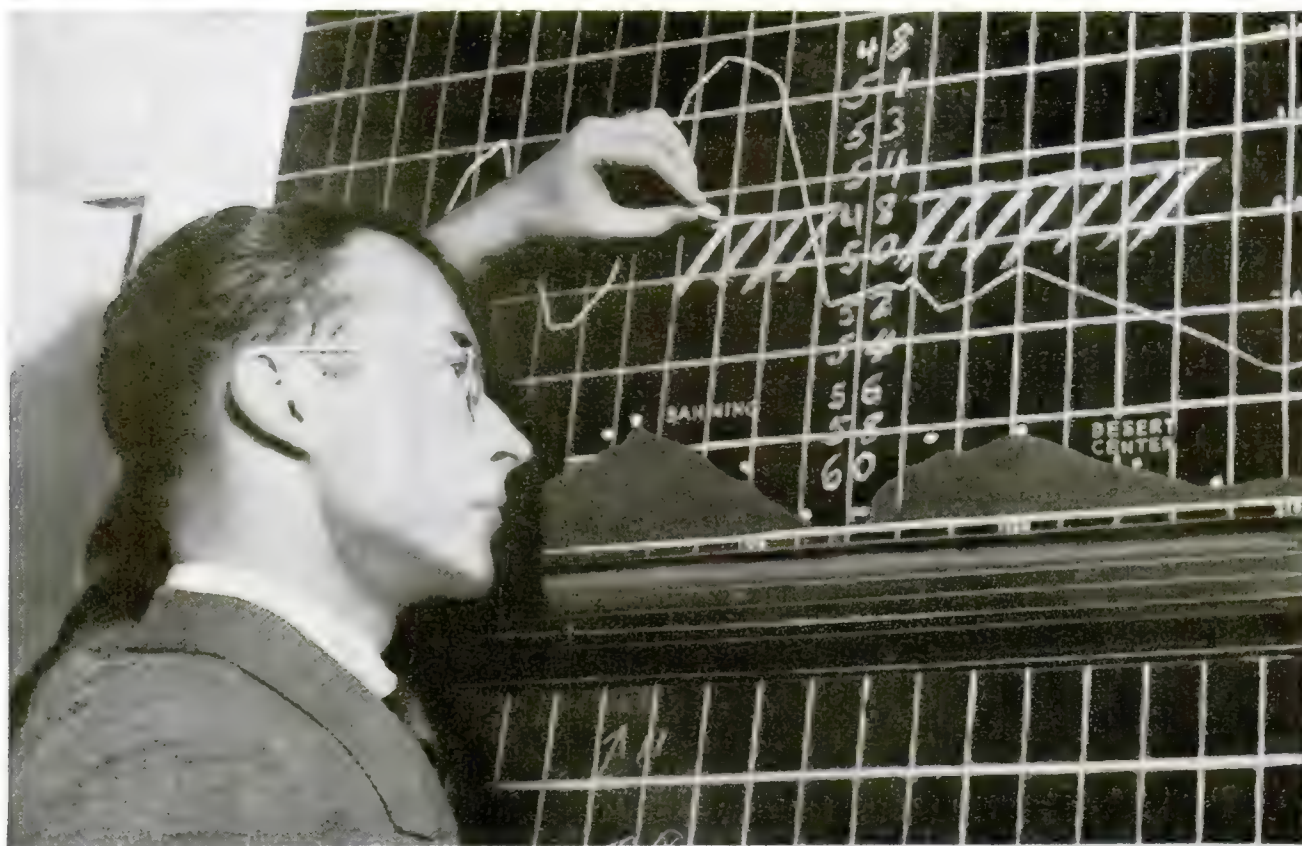


sides from warmer and more moist air masses over the oceans. Frequently these boundaries shift back and forth several hundred miles in a few days but their average geographical positions seem to be pretty well fixed. Ordinarily, oncoming Pacific air provides a mild winter along the west coast, and the cold continental air in the middle west and in the east provides a cold winter climate.

What Dr. Krick noticed was that the cold continental air mass had shifted to the west something like 500 miles and for a time it remained more or less fixed in its new position. The western boundary had moved out over the Pacific. This would prevent warm ocean air from reaching the west coast and led to the forecast of a cold winter for the citrus growers. At the same time, the eastern boundary of the continental air mass had moved inland as far as the west slope of the Appalachians. Put in simple words, this suggested that the forces influencing weather had shifted west



Top, demonstrating how cold-air masses flow under and lift warm air. Bottom, adjusting device which registers data concerning currents at bottom of ocean



Air-line meteorologist plotting top of cloud bank expected six hours in the future. Temperature information radioed by transport pilots is used in this work

for the time being and that in any one place the weather conditions that normally occurred a few hundred miles to the east might be expected, modified by local conditions.

That meant unusual weather everywhere. In the east, exposure to the warm Atlantic air indicated a relatively warm winter with thaws and floods. That is precisely what happened.

The displacement of the continental air mass also seems to account for the devastating floods along the Ohio and Mississippi rivers. The thaws west of the Appalachians contributed their share and the same displacement of the continental air mass that caused them also re-routed the storms that normally travel from west to east along the northern border of the country. Starting out over the Pacific, the storms encountered the cold continental air sooner than usual and were shunted far to the south where they described circular tracks across Mexico and the Gulf and finally made their way up the Mississippi valley. In crossing the Gulf the storm centers picked up tremendous quantities of moisture that were later precipitated in the flood area.

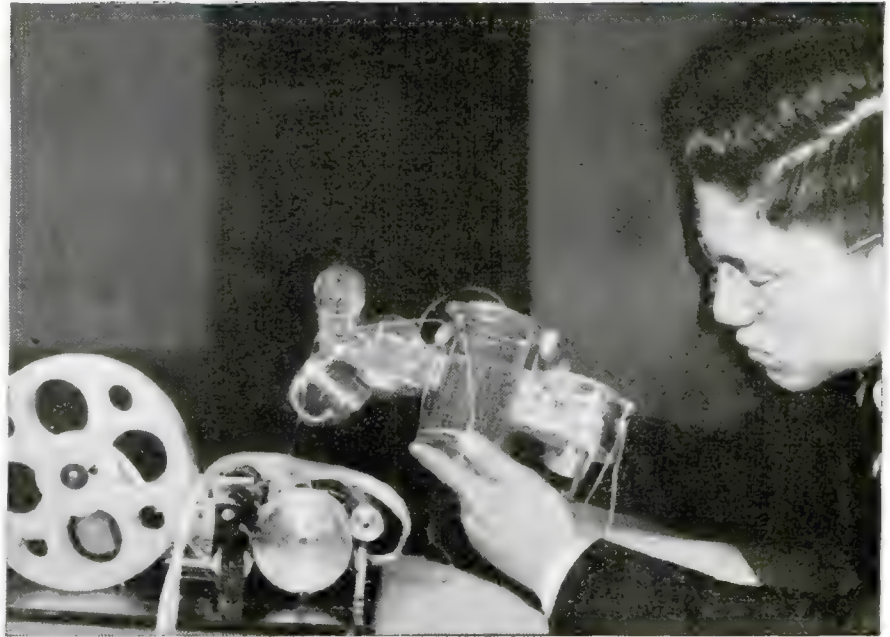
The same westward shift also provides

a reason for the drought in the middle-western dust bowl last summer. Ordinarily heavy showers occur east of the Rockies along the zone of activity that marks the western boundary of the continental air mass. When the boundary moved to the west the showers fell as usual, but last summer the boundary happened to lie over Utah and Arizona instead of the states more to the east. Those states were robbed of their normal summer rains, resulting in the drought.

Even if this extension of air-mass analysis is going to provide the key to accurate long-range forecasts, Dr. Krick won't be ready to depend upon it until the reasons for the behavior of the air masses can be found. One explanation may be found in the fact that last summer unusually high temperatures were recorded by sea-water thermometers in the north Pacific. This suggests that the warm sea water in turn warmed the air above it, allowing the air to pick up more moisture than usual. In turn, this made the air lighter than it is ordinarily. Humid air is always lighter than dry air. The result was that the cold dense air of the continental air mass was able to flow in under the warm air, shouldering it upward and extending its own

cold influence clear to the west coast. Ascending warm air usually meets colder temperatures in the higher altitudes and this results in condensation and then precipitation. It may be that the real key to the climate, at least for part of the coun-

Right, weather-recording instruments and radio transmitter which are attached to small free balloon and sent to heights of ten to twelve miles. In foreground is machine which automatically registers on tape the weather data received from the balloon's transmitter



try, may be found in the sea-water temperatures of the north Pacific.

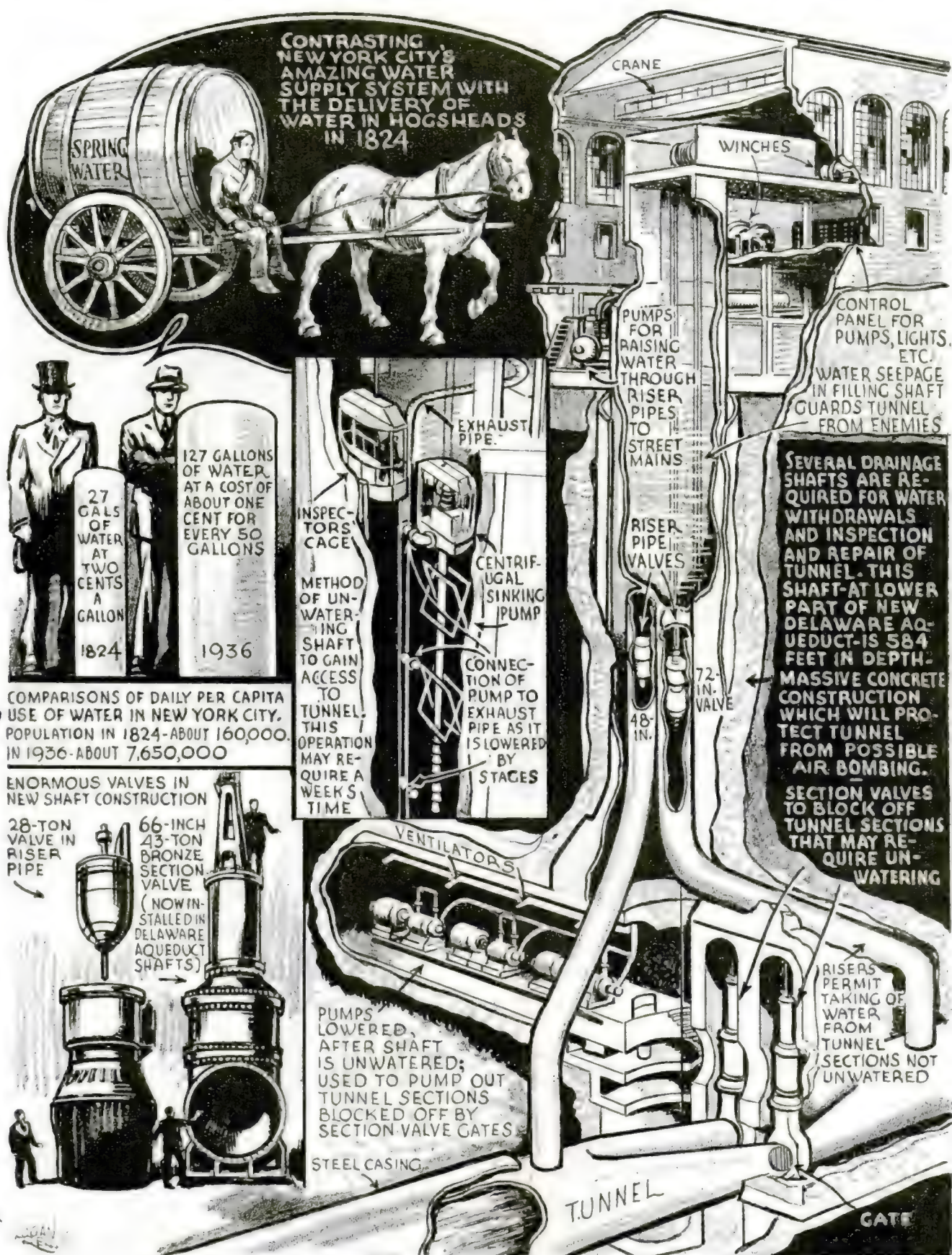
Right now air-mass analysis is serving the weather bureau, air lines, motion-picture studios, and scores of different industries. By knowing what the weather will be like a day or so in advance, motion-picture studios are able to plan their outdoor camera schedules ahead of time with fair certainty. Real-estate concerns depend upon weather forecasts to plan their week-end activities and advertising, and even wayside eating stands regulate their orders for food depending upon

(Continued to page 125A)



Center, sketch showing westward shift of air masses which caused unusual weather. Bottom, measuring snow to determine quantity of water content

Giant Tube to Supply Water for Ten Millions



COMPARISONS OF DAILY PER CAPITA USE OF WATER IN NEW YORK CITY. POPULATION IN 1824-ABOUT 160,000. IN 1936-ABOUT 7,650,000

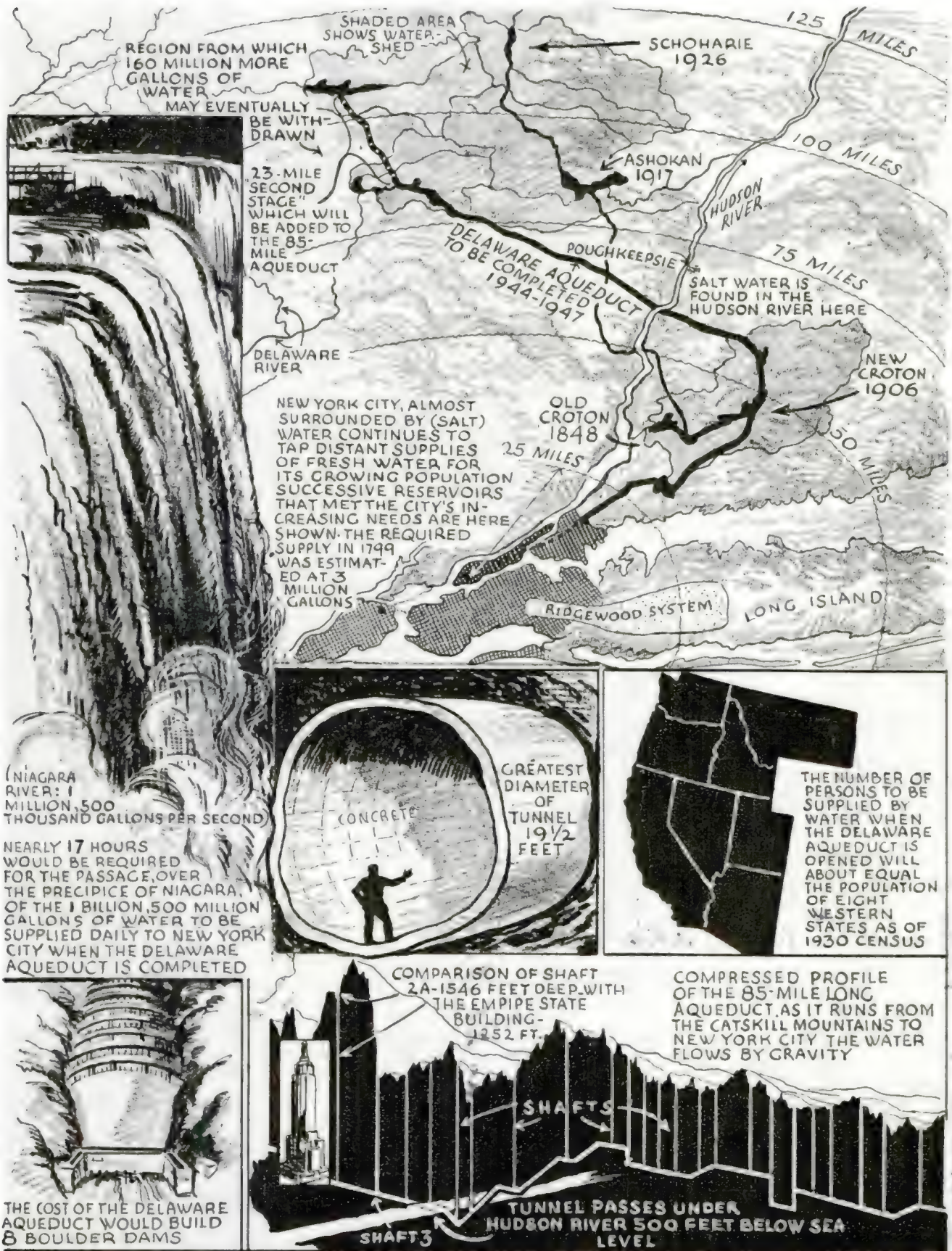
ENORMOUS VALVES IN NEW SHAFT CONSTRUCTION

28-TON VALVE IN RISER PIPE

66-INCH 43-TON BRONZE SECTION VALVE (NOW INSTALLED IN DELAWARE AQUEDUCT SHAFTS)

New York's \$272,587,000 Delaware aqueduct, designed to supply ten million persons with water within ten years, is begun with driving of a shaft, fourteen feet in diameter, which pierces a mountain. Upper left, note how use of water increased as price dropped. Other drawings show features of the shaft which will tap the water supply in a giant tunnel. Massive concrete construction will protect water system from bombs dropped by enemy planes

Eighty-Five Mile Tunnel Taps Vast Watershed



Tapping a vast watershed, the huge tunnel will convey by gravity one and one-half billion gallons of water each day from the Catskill mountains to New York, a distance of eighty-five miles. The greatest diameter of the tunnel will be nineteen and one-half feet. In map at top, note various sources which have been tapped and spot from which 160 million gallons more per day may be drawn when the population warrants such an extension

Ventube flexible ventilating tubing used in permanent shafts supplying air to tunnel

es 575

Flame-Throwing Tank Practices for War



Fire-shooting tanks in action. Note the trailer pulled by each of these war monsters. Crowd in distance at right witnessed this awe-inspiring spectacle at recent army maneuvers at Rome, Italy

Shooting a solid column of flame far in front as it traveled, the latest Italian army tank was put through its paces recently at a war demonstration in Rome. Flame-throwing was used to some extent in the world war, but the method of producing

and projecting the column of fire was far from efficient. The modern tank, towing a small two-wheeled trailer, performs its destructive job in an awe-inspiring manner as a result of improvements on the method employed two decades ago.

es 552

Instant Heater on Water Faucet Needs No Extra Pipes

Eliminating the added expense of installing hot-water pipes and tank, the latest type of hot-water heater is installed

no tank

over the sink and connected with the regular cold-water pipe. When the hot-water faucet is turned on, gas is automatically lighted in the heater and hot water is supplied instantly. The burner shuts off when the faucet is closed. The temperature can be adjusted by mixing the two faucets.



Instant hot-water heater over sink saves cost of installing usual dual pipes for hot and cold water

Detection of Old Bloodstains May Aid Crime Fighters

Detection of bloodstains several weeks old, even though they have been wiped off and exposed to the rain, is claimed to be possible with the aid of chemicals which react with the hemin in the blood to create a brilliant blue luminescence. A solution of peroxide and a derivative of phthalic acid are employed. Hemin is a constituent of all blood, but is found in higher proportion in old than in new blood. The meth-

United American Book Corp. printed March

*es 592
may 24, 1937
science*

method is completely automatic

od, reported in Germany, appears to have importance in crime detection because the chemical reaction is very specific and does not occur with other substances. It is especially useful since large objects can be submitted for examination and the spots thus found further investigated by other methods.

530
**One-Piece Helmet
Cut to Protect
the Welder**

Formed of one-piece vulcanized fiber and cut deeply for extra protection, a new welding helmet now on the market is said to have exceptional ruggedness to withstand hard shop use. Riveted, lapped-over seams or joints are eliminated. A smooth, rounded interior promotes air circulation and results in a cool, comfortable helmet. The deep-cut design gives protection on the sides of the head to a point well back of the ears.



Welder on the job, protected by the one-piece helmet that fits closely about head

Willson Products
Inc., 200 Thoin St
Reading, Pa.

**Tractor Driven Like Dobbin
Responds to Farmer's Reins**



It's just like driving a horse to handle this tractor. The farmer steers and controls it by manipulating the reins leading to a control box

Although it can't answer to "Giddap" or "Whoa," the latest farm tractor responds to the reins just like old Dobbin. The controls of this gasoline-eating draft horse, invented by two brothers during eight years of experiment, are located in a small iron box behind the motor. When the farmer pulls in the reins, the tractor halts. When he releases them, the machine moves forward. It backs up in response to a hard pull on the lines, and is turned by jerking one rein.

593
**Soap Is Pumped into Oil Well
to Stop Flow of Water**

From the ring around the bathtub engineers have learned how to prevent the "drowning" of oil wells with water. A Texas oil company has patented a method of pumping ordinary soap solution into the bore holes of oil wells to plug the pores of underground sands and stop the flow of water into the oil. The soap reacts with magnesium and calcium salts in the water to form a tough soap curd, just as salts in hard water react with soap to form the ring around the tub. Soap does not affect the flow of oil.

assigned to Standard Oil
By photographing the sound wave in the core of an electric welding arc its temperature has been computed around 10,300 degrees F., hotter than the sun's surface.

General Electric Review
May 1937

Mr. Oertl 13 Ozham
Layton, Salt Lake City, Utah
N.C. Roadway
George E. Cannon
Invention Co. 1 Layton, Texas
26 Roadway

es 523 Cmt Thomas E. Shimeon, Jr. 10555 Hollywood Ave. Los Angeles

FIRE and water don't mix and that simple rule makes water the best all-around weapon that fire fighters have. But it is far from perfect because it can cause a lot of damage. Sometimes the water poured into a burning building does far more harm to the contents than the flames themselves.

"One classic example of that is the time that firemen dashed up to a smoking house, threw open the front door, and sprayed water into the interior," recalls Capt. C. B. Lesinsky of the Los Angeles fire department. "When they thought they had flooded the fire they cranked their nozzles shut and walked inside. Instead of the remnants of a big blaze they found only a large bundle of rags smoking in an open oven. The fire had done no damage at all but the water had ruined the walls and furnishings of three rooms."

Fire fighters know better than that now. These days they rarely turn on their water until they have real flames for a target. They use less water than ever before and try to make every drop count. When they roll up to a fire they

SALVAGE SQUAD



Top, pulling protective covers from salvage truck. Bottom, left, salvage men unloading equipment from truck. Right, protecting office records against damage from water

TO THE RESCUE

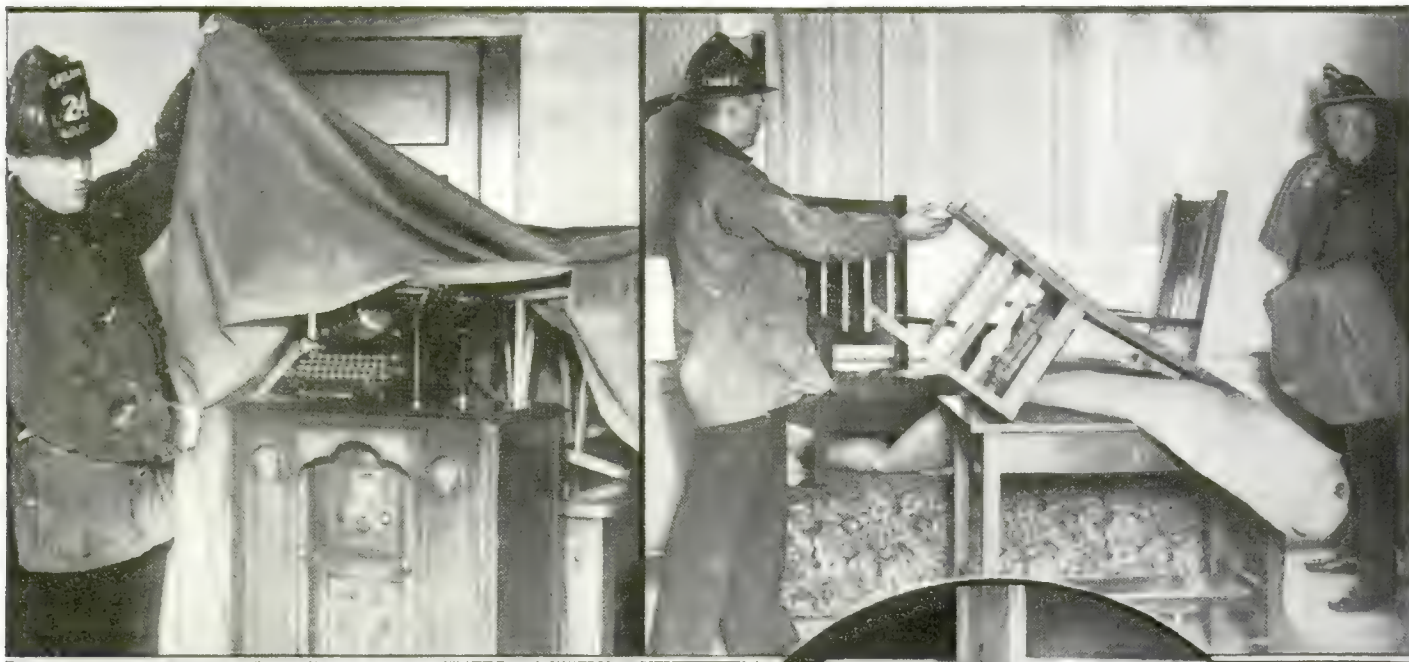


are accompanied by a salvage corps whose methods also have been revolutionized to keep pace with modern fire fighting. It is the job of these men to protect the contents of the building, to minimize damage by water and chemicals from the fire hose.

Last month a residence in Los Angeles caught fire and was almost totally destroyed. But not one cent of damage was done to the furnishings. Books, rugs, and even delicate curtains were unharmed by fire or water. The salvage squad of the fire department, working shoulder to shoulder with the fire fighters, saved every article in the house. That was an unusual record, but salvage nearly 100 per cent complete is becoming common at fires.



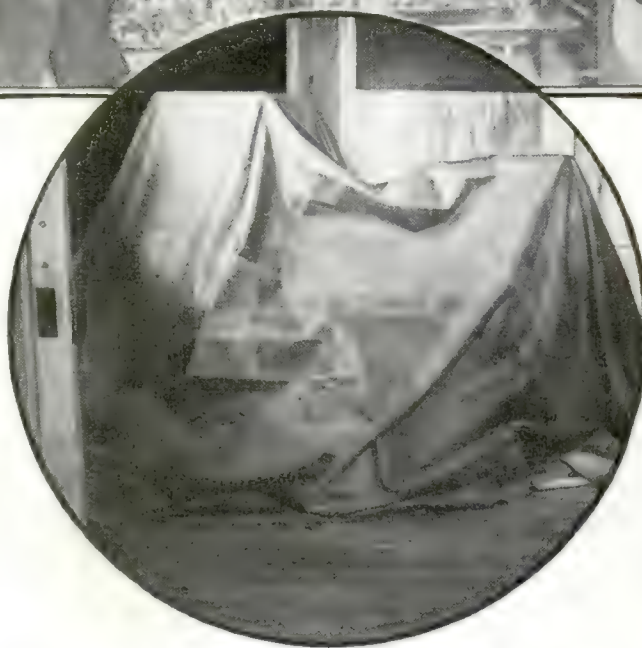
*Top, rigging up hydraulic siphon to suck water out of basement.
Bottom, left, water pouring out of house on salvage covers.
Right, salvage squad on way to a fire*



Modern salvage got its start when fire fighters began to realize that sometimes ninety per cent of the damage is caused by water. A few shingles may cover the damage of a roof fire but the water used to put it out can ruin ceilings and furnishings. In a commercial building a little water flowing down a stairway can spoil thousands of dollars worth of goods that were never threatened by the flames. In some cities, such as Los Angeles, salvage squads are part of the fire department. In other communities private patrols turn out when the property of subscribers is threatened.

When salvage men plunge into a burning house they go through the rooms like whirling dervishes. Working in pairs, the men protect the furnishings apt to be harmed by water. The front room comes first in a residence because its contents are the most valuable. Radio plugs and other electrical connections are pulled free. Chairs, tables, and sofas go into a big pile in the center of the room. Pictures are laid face down on a sofa. Flower vases are emptied of water before being placed on upholstered furniture. Curtains and drapes go into the pile.

The men work fast but they are in no haphazard hurry. They may be moving around in dense smoke only a few yards from the fire, still they get their work done rapidly and without damage. The place for rugs is on top of a piano or table where they will protect the finish. Every-



Top, left, laying covers over stack of furniture. Right, stacking furniture. Bottom, covers in place, protecting furniture from water

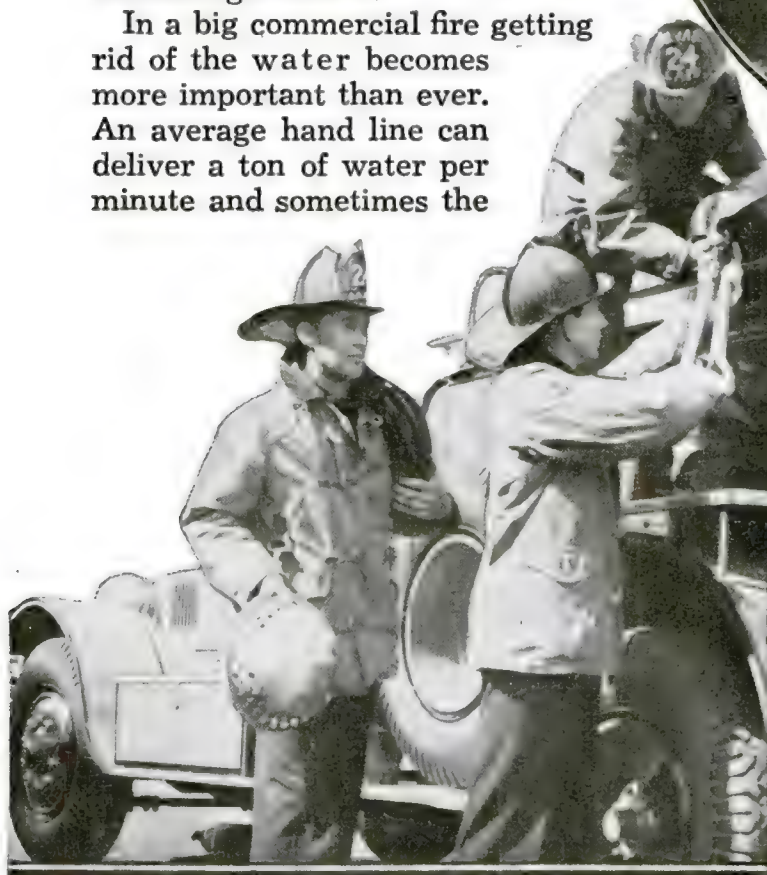
thing in the room goes into the pile. Finally the salvage men flip huge rubberized tarpaulins over the heap. If the fire is on an upper floor and if the room has a central chandelier one of the men climbs to the top of the heap and pushes down the tarpaulin to form a basin.

"Water seeping through a ceiling first starts to come down the chandelier hole," Capt. Lesinsky explains. "The idea is to catch this water in the top of the salvage cover and drain it down to a bucket at one side instead of letting it spread over the floor. In the bedrooms we pile everything on a bed and move it to the center of the room before covering the heap with tarpaulins. Sometimes when a lot of water is coming through a ceiling we hook sal-

vage covers to the picture molding on the walls to catch the water and chute it through an open window. As the last resort we move the furniture outside. It has to be carried out, not tossed through a window or door."

In the meantime other salvage men lay tarpaulins on the stairways to act as flumes for carrying off water. Down below other salvage covers with rolled-up edges to make a trough are laid to form a channel from the stairs to a door. Getting rid of the water is just as important as protecting furnishings from it.

In a big commercial fire getting rid of the water becomes more important than ever. An average hand line can deliver a ton of water per minute and sometimes the



fire fighters have to pour tremendous quantities of water into the upper stories of a building. The sheer weight of the water might be enough to cause collapse of some structures. It's up to the salvage squad to get the water out of the building almost as fast as it goes in. In big fires an elevator shaft is a convenient channel for waste water and salvage men have even punched holes in the side of a burning building when they had to get the water outside as fast as they could. If water drains into the basement the next step is

(Continued to page 144A)



Top, sweeping out water. Center, unloading salvage apparatus. Bottom, emptying water from building

ried on airplane journeys, the instrument traces a curve which enables engineers to reconstruct every roughness of the voyage and to tell what stresses the plane withstood. A new wind tunnel also aids in the same line of study. Gusts are made to order in the tunnel and model planes are catapulted into them. As fast as an arrow is shot from a bow, the tiny planes are accelerated to fifty miles per hour in a few feet of travel. A motion-picture camera makes a record of the reaction of the model when it strikes the artificial gust of wind.

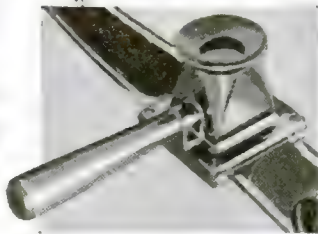


It's feeding time for this family of orphan coach puppies. This rack apparently is a good substitute for their mother

Solving the problem of how to feed a family of motherless coach dogs, the owner rigged up a rack with bottles, one for each puppy. So well does the rig meet the need that the puppies seem to be thriving as well as if being fed by their mother.

"Reading Glass" for Microfilm Magnifies Tiny Image

1 To make it easy to inspect microphotographs on thirty-five millimeter film, a "reading glass" has been developed. Li-



braries are copying newspaper and textbook pages on motion-picture size film to save storage space, but to read such tiny print requires either a projector or

the new microfilm reader, which has a magnification of seven and one-half to eight times. The film enters at either side, sliding into reading position easily.

Bump Recorder Aboard Plane Shows Roughness of Trip

Gusts of wind are being measured and studied with the aid of two new devices. One is a "bump" recording instrument small enough to fit into the pocket. Car-

Portable Stroboscope Light Sees Motor in Slow Motion

High-speed motors can be inspected in "slow motion" under the fast-winking eye of a portable, low-priced stroboscope just developed. Plugged into an alternating-current outlet, its neon spotlight throws an intermittent beam which is adjustable in its flashing rate so that the action of



Portable stroboscope slows motion of engine fan for inspection while it really runs at full speed

valve springs, gears, fan or any moving part can be slowed down or stopped. Similarly, the engine speed can be checked by adjusting the light until the engine appears motionless and then reading the speed rate on the stroboscope dial.

speed rate on the stroboscope dial.

222

POPULAR MECHANICS

Bottle-Feeding Rig Solves Problem of Orphan Puppies

It's feeding time for this family of orphan coach puppies. This rack apparently is a good substitute for their mother

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National Advisory Committee for Aeronautics Langley Field, Va

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Portable stroboscope slows motion of engine fan for inspection while it really runs at full speed

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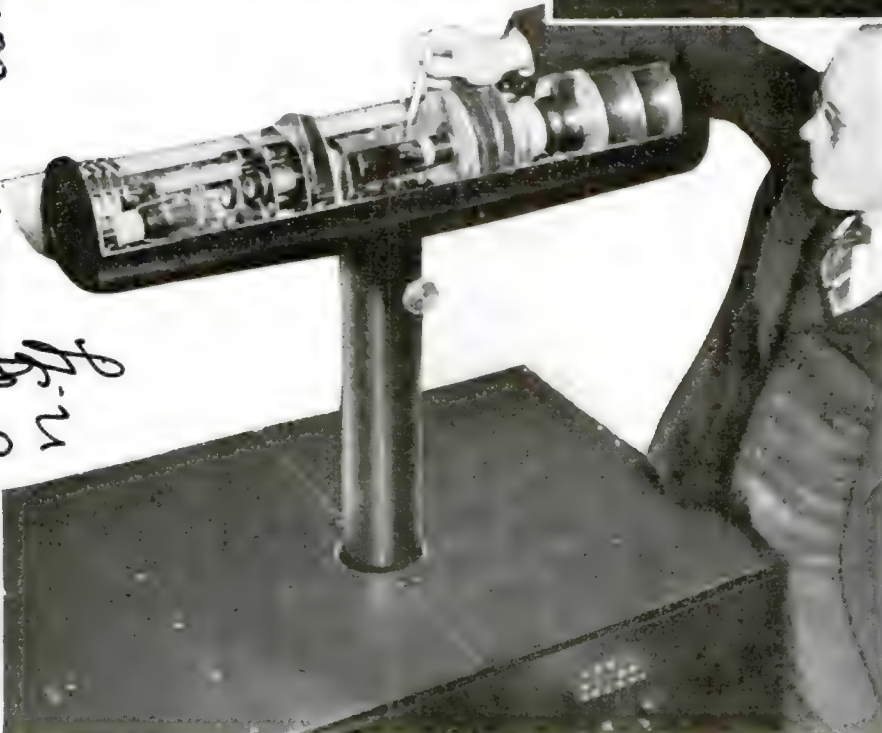
General Radio Co. Cambridge, Mass

Television Projected on Large-Size Screen

Television on a screen, with images eighteen by twenty-four inches, has been made possible by the invention of a new cathode-ray tube. The pictures have a brightness equal to that of home movies. By increasing the distance from the screen it is possible to obtain pictures as large as three by four feet, clear enough to be viewed by an audience of several hundred. Enlargement is obtained through a simple optical system placed before the fluorescent end of the new tube, where the original picture appears. The tube is the outgrowth of the kine-



Left, pointing to the tube which is key to instrument which enlarges and projects television images like that shown above



scope, the television receiving tube that paints images on its flat end but does not project them. The largest kinescope with a viewing end fifteen inches in diameter produces pictures nine by twelve inches. The tube, which was invented by Dr. R. R. Law of R.C.A. laboratories, was demonstrated at a recent convention of the Institute of Radio Engineers.

Super-High Voltage Built Up by Artificial Raindrops

Showers of electrically charged artificial raindrops are the basic factor in the latest high-voltage electrostatic generator designed for bombarding the nucleus of the atom or for X-ray treatment of disease. The high voltage is built up in the same way in which nature generates the enormous voltage of lightning. The artificial rain consists of a spray of semi-conducting liquid which falls through an intense electrical field. Electrical charges are thus carried to the "ground" below, which is a container attached to the high-voltage

generator. The small electrical charges are conducted to great storage spheres. The new generator is remarkable for its absence of moving parts. The raindrops replace silk or paper belts employed in other generators to carry the electrical charges into storage spheres. One type of belt generator is capable of attaining a potential of 5,000,000 volts.

Gas diffusing through solid metal at a rate of one cubic inch in 100,000 years can be measured with a metal vacuum tube.

Assigned to
The Radio Corp. N.Y.C.
30 Rockefeller Plaza

General Electric Review
May 1937

General Electric Co.
1285 Boston Ave.
MECHANICS
Buffalo, Conn.

224

POPULAR

MECHANICS

Doughnut Loader Fills Bag by Means of Ramrod



Ramming home an order of doughnuts with a transparent bag fitted over end of special doughnut loader

Doughnuts being an awkward product to package, a special doughnut loader has been developed. A transparent bag is held open at one end of a channel which is loaded with doughnuts, and a hand ramrod shoves the doughnuts into the bag.

Rear-Engine Auto Seating Eight Is Furnished Like Trailer

Combining features of both automobile and trailer, an eight-passenger streamline car just designed is driven by a rear engine. Noise, heat and odor of the motor are left behind. Inside, this car has a table, icebox and studio couch for two. The chassis and body form an integral unit entirely of steel, able to stand the shock of



Eight-passenger teardrop car with rear engine. It has an icebox, table and studio couch for two.

collision. Large windows offer good visibility, and the driver's seat is mounted further to the front than in the conventional automobile.

Angle Plug Will Not Dislodge When Cord Is Pulled

Rubber electric plugs molded with the cord at right angles are being introduced. This design permits the cord to lie flat against the wall or baseboard, and the plug does not become dislodged by a direct pull on the cord, making it neat and safe.



Non-Drip Server for Sirups Pours from the Bottom



This sirup server has no dripping spout. It pours from bottom and spring-operated spigot seals it

Honey, sirup and salad dressings can be served neatly and without dripping, from a table dispenser with an opening in the bottom. The glass dispenser rests in a glass bowl on the table, and both parts are easy to clean. Pressing the lever raises the spigot rod and the honey pours from the base; when the lever is released, the spring-operated spigot seals the opening, keeping the contents sanitary.

551 Fifth Ave
New York

Stop-and-Go Lights Control Big Liners in Port

Right, pressing button to change dock signal. Circle, tugs maneuvering big liner toward its pier. Left, traffic signals at top of photo aid in handling the ocean-going craft. The system also is a safety measure, reducing the chance of collisions



Traffic signal lights installed recently at the French Line pier, New York, facilitate arrival and departure of ocean liners. In order that ports for passengers and freight will not be interfered with by pier girders, a big ship must lie within a few inches of the same position each time it docks. An engineer sights along one of the girders toward a marked plate on the ship's side. With a switch on a flexible cable he signals, a green light for "go forward," a red one for "go aft" and a blinking yellow light instructing the captain how to inch the ship to exact position. For departure of the "Normandie," "Ile de France" and other big craft there are two units of two

lights each, one at the end of the pier to warn river traffic and the other close to the bridge of the ship. These are operated by the marine superintendent who surveys the river from the tip of the pier. Just before starting time a red light is flashed, warning river boats that the liner is soon to back out. At the moment of scheduled departure a yellow light is flashed, telling the captain the river is clear. If it is not clear, a siren is sounded and the yellow light is delayed until it is safe for the liner to leave.

610 Fifth Ave. New York

2368.

THRILLS



ideal. Smacking into the hills of solid water will rip the bottom out if the hull is poorly built. The crash of landing may bend the wings down in a permanent curve or even tear the motors loose from their mountings. If something goes wrong the pilot may be able to taxi back home on the surface, or he may have to send out a radio plea for help.

What's it like to crash one of the big boats on purpose? For one thing, your safety belt must be around you and tightly fastened. The boat hits with a smash and throw-

WHAT happens to a twenty-ton flying boat if it is slammed into mountainous waves while going seventy miles per hour?

Nothing, if the boat is as sturdy as her designers think and the pilot is one of the best in the world.

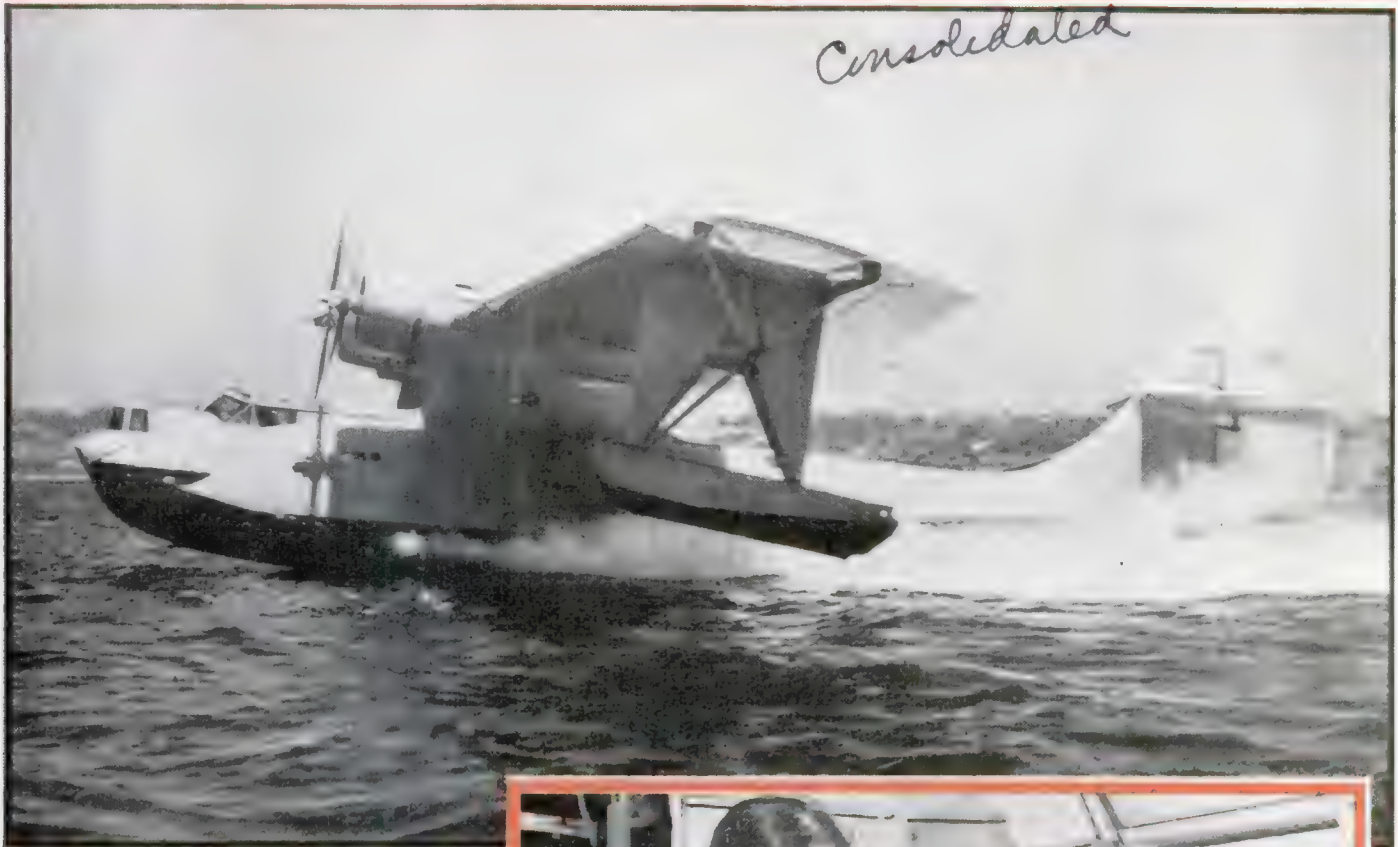
Tumbling a big transport around in the sky is just routine to a test pilot, but taking a big flying boat out for her rough-water landings is something that always packs a thrill. This supreme test is part of the Navy's requirements because when one of the big "ducks" goes to the rescue of a plane or ship in distress it is usually in bad weather. The pilot has to know that his boat can take a terrific beating and get back up into the air again safely. That's why the pilot picks rough water for his proving ground. Waves twenty or thirty feet high are



Top, pilot at controls of flying boat. Bottom, engines of flying boats and amphibians are mounted high above water to avoid spray

Capt. Thomas E. Stinson, Jr. is 368
18555 Hollywood Ave
Los Angeles Calif

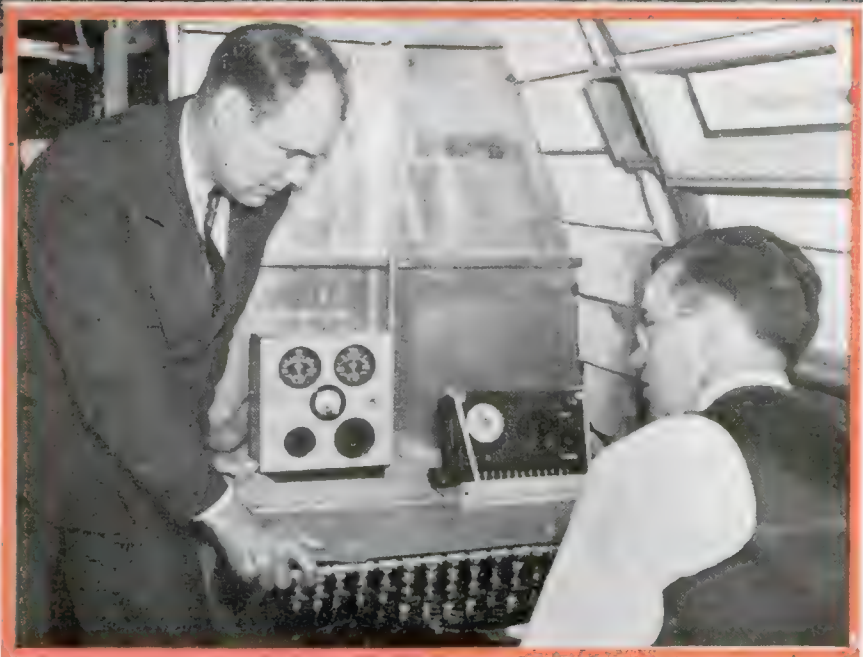
of the NAVY Test PILOTS



Consolidated

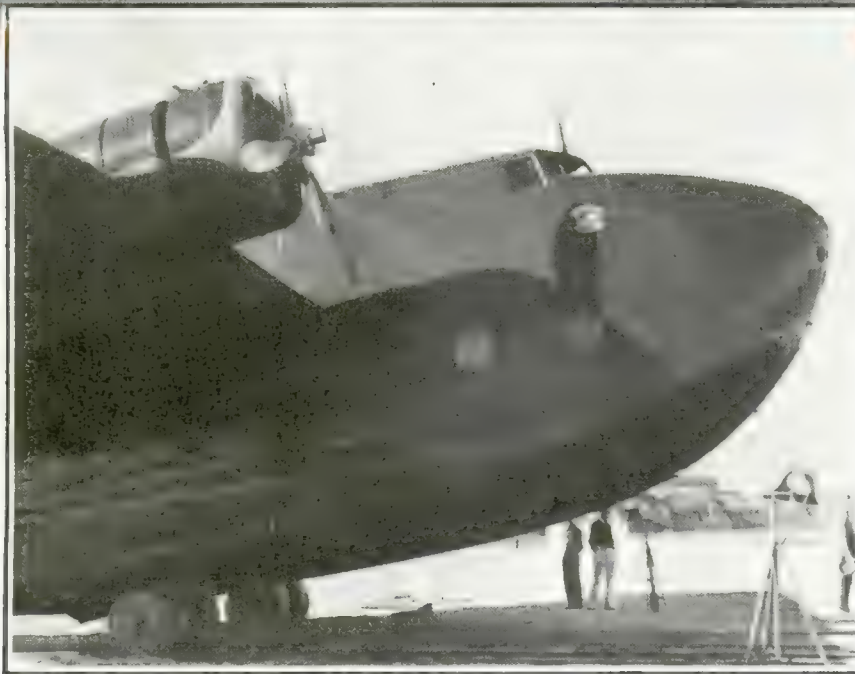
ing motion that tosses everything around. Men who have tried to stand up during a rough landing have broken their ankles. Mingled with the thunder of the impact is the screech of metal as it strains under the shock. The jar of landing imposes the same terrific strains that a terminal velocity pull-out gives to a fighting plane. In test pilot lingo, the impact may amount to eight or nine "Gs," which means that the boat and crew are subjected to a pull of eight or nine times normal gravity.

"Getting down safely is a touch-and-go maneuver that you can't plan out ahead of time," one pilot says. "It all depends on the directions the wind and waves are running. Sometimes it is best to land into



Top, big flying boat getting up speed for the take-off. Bottom, pilot confers with engine inspector after completing tests on plane

the wind and take your chances with the waves. But if they are running too high you have to land parallel with them and fight the cross wind. If you catch the bow in a wave it may cave in like an eggshell. A stray wave crest may flick a wing pontoon off cleanly.



Top, seaplane landing in a cloud of spray in rough sea. Bottom, big flying boat on its beaching gear

"The best way to land is between the crests and you try to drop the boat in solidly. A good landing is a two-point landing and the pilot can pick out the 'slap slap' of the hull as it touches first on the heel and then on the toe. One minute you are flying a big airplane and the next you are struggling with the controls of a bouncing boat, trying to kill its speed and face around into the waves without getting a wing under."

Pilots find that the best way is to drop the boat into the water from a three or four-foot height so that the water can get a good grip on the hull and slow it down. If the pilot makes a bad guess and hits the

heaving surface with too much speed or at the wrong angle the huge boat slams through the water like a skipping stone. It may bounce back up into the air time after time.

Once the fuel line of a single-engined boat broke while the boat was flying off Haiti. The pilot came down into the water at fifty miles per hour.

There was a heavy sea running and the boat hit hard, bouncing thirty feet into the air. The pilot fought to keep the wings level and down the ship went again, this time bouncing ten feet. On the next drop the boat stayed down. The three crashes buckled the motor struts and the boat was in no condition to fly, so the radio operator got off an emergency message and the rest of the crew broke out a sea anchor. They rode it out until they were rescued next day. That was several years ago. Today the big boats must be able to take even worse beatings without damage.

"Even more exciting than a landing is a rough-water take-off," one of the pilots

says. "Just how you do it all depends on the wind and waves. In a heavy storm you may have to ride it until things calm down a bit. Usually you try to take off into the wind although sometimes you make a downwind take-off. Other times the boat may lift easiest in a cross wind and then you guide the plane to follow along a wave crest while you get up flying speed.

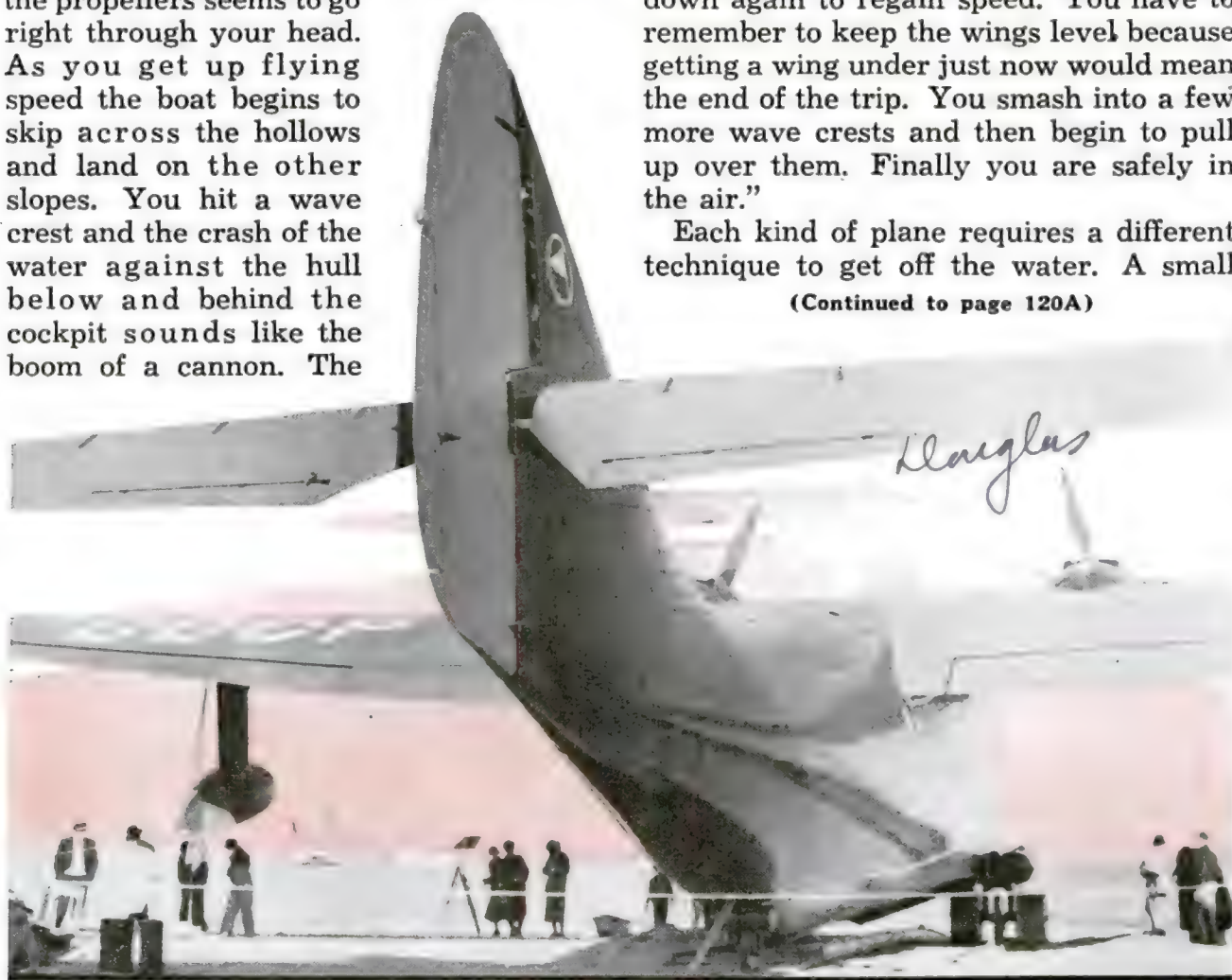
"In a take-off directly into the wind and waves you get what amounts to a high-speed roller-coaster ride. One minute you are on a crest looking down into a deep valley right under the boat and the next you are down in the hollow climbing the next wave. The motors are on full and the high scream of the propellers seems to go right through your head. As you get up flying speed the boat begins to skip across the hollows and land on the other slopes. You hit a wave crest and the crash of the water against the hull below and behind the cockpit sounds like the boom of a cannon. The



plane staggers. Sheets of spray explode upward over the wings. You can't see through the flying water but you have already pulled the nose of the boat up to prevent crushing it and now you nose down again to regain speed. You have to remember to keep the wings level because getting a wing under just now would mean the end of the trip. You smash into a few more wave crests and then begin to pull up over them. Finally you are safely in the air."

Each kind of plane requires a different technique to get off the water. A small

(Continued to page 120A)



Top, temporary interior finish of air liner while undergoing government tests.
Bottom, tail group of giant Douglas flying boat on the beach

Self-Cleaning White Paint Latest for Homes

Right, painting house with self-cleaning white. Center, comparing ordinary white paint with self-cleaning type after weathering. Note how much whiter is the self-cleaning paint, shown below. In bottom photo, house remains white after long periods of weathering



particles of the pigment separate themselves from the surface and carry with them accumulated dirt and dust. This chalking goes on so slowly that the reduction in thickness of the paint film is hardly noticeable. After years of weathering the chalking process leaves the surface in excellent condition for repainting. A new material, titanium oxide, which

Prepared for outside surfaces of homes or other buildings, a self-cleaning white paint now on the market preserves appearance by remaining clean and white after years of weathering. Dirt and dust are washed away by rain. Gradual wearing away of the topmost film of the paint, a process known as "chalking," is responsible for the self-cleaning feature. Tiny

is noted for its opaqueness, is used in the self-cleaning paint. This property of super-whiteness makes it possible for the painter to get desired results from fewer coats and in less time. The self-cleaning paint gives full protection to surfaces. Unpainted wood, exposed to the weather, will crack and check and warp so that the tightness of the house against heat and

E. I. du Pont de Nemours & Co.
2100 Elston Ave. Chicago

Krebs, Pigment and Color Corp., Newark, N.J.
Thomas and Vanderpool, St. Louis

Chicago - W. 21st
Ana S. Seena

cold will be affected. Nails will rust and boards will pull away from the side of the house, all contributing to rapid deterioration. Early white house paints consisted of white lead in linseed oil. Then paint manufacturers discovered that addition of other pigments, notably zinc oxide, greatly reduced tendency of the paint to collect dirt. Continued experiments brought the titanium paint.

Stop Light at Dangerous Curve Is Operated by Autos

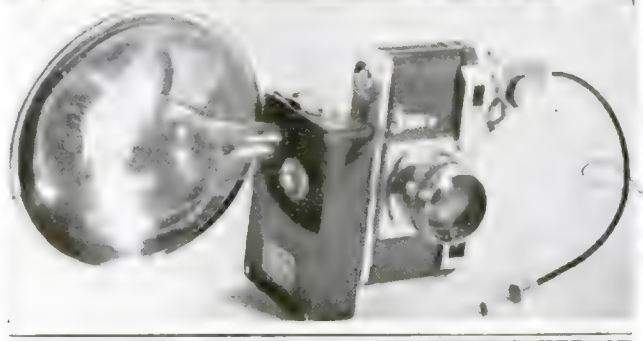
Safe speeds in rounding a dangerous curve in one American city are attained by regulation of traffic by a stop-and-go light. The overhead traffic signal displays a red light as a vehicle approaches the corner. One hundred feet from the light is an illuminated sign warning the driver to reduce speed to fifteen miles per hour. As the auto passes the sign it goes over a metal box embedded in the right-hand traffic lane. A microphone within the metal box picks up the car's sound waves and converts them into electric impulses which actuate a timing mechanism. If the car is traveling at safe speed the timer switches off the red light and turns on an amber light soon enough for the car to round the curve without stopping. A car moving outside the right-hand lane will not operate the signal and the red light will remain burning. At each end of the curve is a sign which lights up when a car is approaching from the opposite direction.



Switch set in roadway operates traffic signals at dangerous corner ahead

Cmt. N.C. McLeod
2720 Maryland Ave
Baltimore, Md.

Longer Flash Photo Bulb Makes Candid Pictures



Camera with wire-filled flashlamp and synchronizer snaps action pictures like the one above

Filled with a measured length of hydro-lanium wire instead of aluminum foil, a new type photo-flash bulb has a peak illumination characteristic considerably longer than the foil-filled bulb. Thus the slit in the camera shutter curtain is given ample time to cross the film focal plane before the light begins to diminish, solving the problem of unevenly exposed negatives. The bulb is designed for synchronized flash work with Leica and Contax cameras. Another new development in the same field is a speed flash adapter, an inexpensive device consisting of a special release fitting and a plunger spring matched to the tension of Contax and Leica shutter releases. Tests with the new bulb and a speed flash synchronizer show that satisfactory results can be obtained at all shutter speeds from $\frac{1}{50}$ to $\frac{1}{1250}$ second.

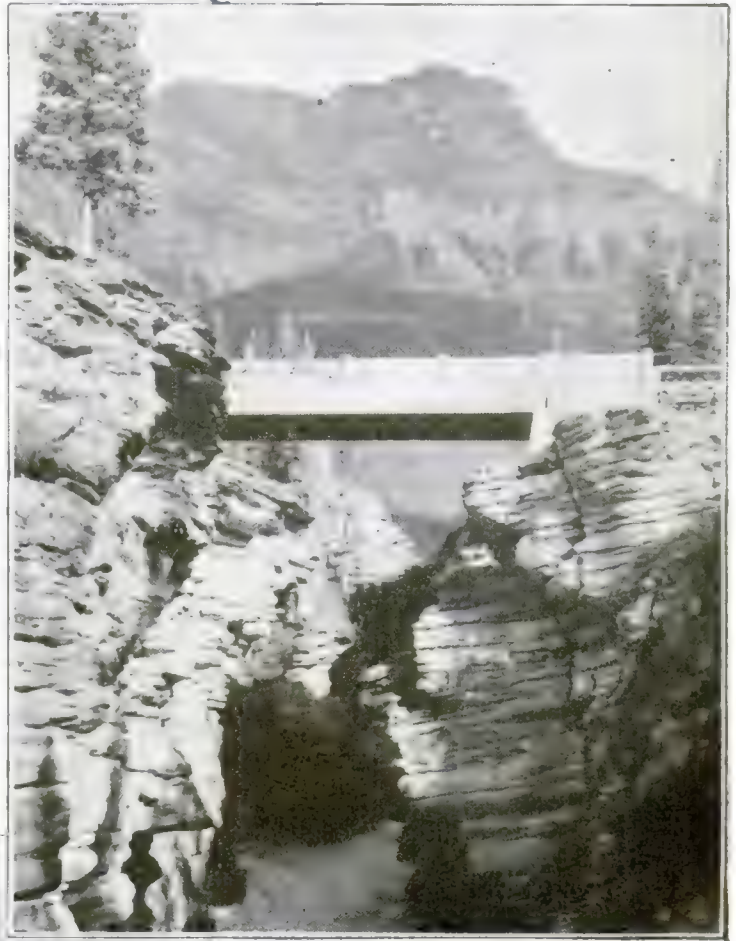
Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

The Kalan Co., 58 Warren St.

es 407 Cmt. James Montagues,
517 Harbour Commissioner Bldg
Toronto 7 Ontario
Spectacular *Canada* SCENIC

ALONG passes between snowcapped mountains 11,000 feet high, Canada is building what is considered North America's most spectacular scenic highway connecting Banff and Jasper on the Alberta-British Columbia boundary. The road builders have completed nearly half the route using the latest equipment and engineering developments. No settlement of any kind is on this road, built through a mountainous area seen by few people since the white man came.

Surveyors went in with pack ponies, fording icy mountain streams to find a scenic route which would safely skirt the Columbia ice field, the source of one-fourth of the waters of North America. Clearing crews followed and are still operating to make a right of way through virgin forest in mountain valleys, to blast a road along narrow mountain ledges.



**Top, modern bridge across Athabasca Falls on Banff-Jasper highway.
Bottom, section of completed road skirting Athabasca river**

Tractors pulling in supplies, grading machines and trucks followed. So remote is the district that building operations can be carried on only in summer.

The 185-mile highway, starting northward at Banff where United States roads connect, follows the great inter-mountain trench in the Canadian Rocky Mountains between peaks which form the backbone

of the North American continent. It crosses the Bow Pass, 6,878 feet above sea level, spans foaming mountain rivers, and goes gradually down to the mother of glaciers, the Columbia ice field. Then the road climbs again to cross Sunwapta Pass, 6,675 feet above sea level. Here deep canyons cross the route, and to avoid these engineers have designed a series of switch-back roads, blasted out of rock walls, making a gentle twisting grade to the valley below, where the road crosses spectacular Athabasca Falls by a concrete and steel bridge, and starts climbing again to reach the town of Jasper. The road connects Banff National Park, 2,600 square miles in area, with Jasper National Park, 4,200 square miles in area.

HIGHWAY

Built in Clouds



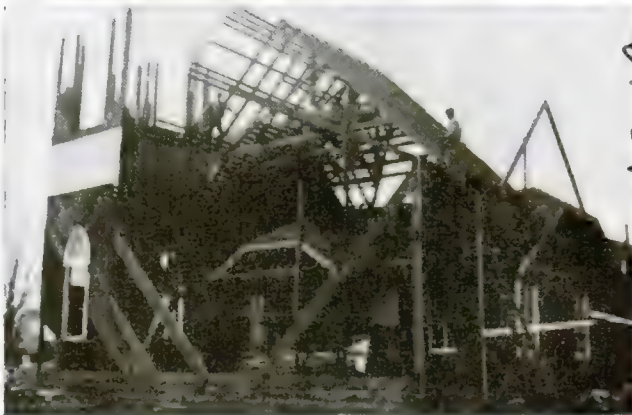
Above, map of territory traversed by new road. Right, Athabasca Falls viewed from highway across canyon. Bottom, graders working on scenic road

Eighteen feet wide, the highway will have an all-weather graveled surface. The most difficult stretch to construct was the series of switchbacks. For seven miles the road builders had to hang onto sheer rock walls to dynamite the right of way. While work has been going on from both ends not more than seventeen miles can be graded and surfaced each year. Typical of problems faced by engineers was one stretch over so many mountain streams that six bridges and 215 culverts had to be installed. Completed sections are to be opened to motorists this summer. This road forms the first section of a northern Canadian transcontinental feeder route to Prince George and Prince Rupert on the north Pacific coast.



Es 512.

Bungalow Built in a Church as Wreckers Dismantle It



Church in Aurora, Mo., before, during, and after it was transformed into a six-room bungalow

It was winter when a man in Aurora, Mo., was ready to build a home, so he built it indoors. He bought a frame church which was being abandoned, and while the wreckers dismantled it they used the same building materials to construct a six-room house which grew inside as the church came down. The church roof provided protection from the weather until it was needed to roof the bungalow.

Insulin Dose Made More Potent by Addition of Zinc

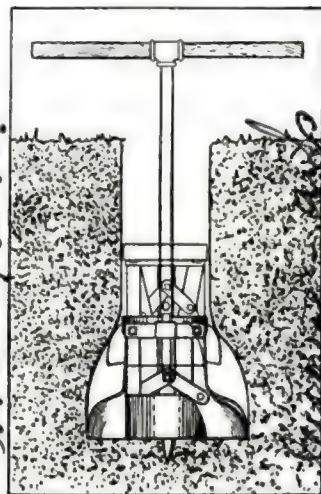
Insulin may be given vastly increased power in the treatment of diabetes by adding zinc to ordinary insulin. Sir Frederick Banting, Canadian scientist who dis-

covered insulin, says the new zinc insulin, in tests on dogs, proved effective in lowering the dangerous blood sugar for a prolonged period. It has not yet been adequately tested on human patients.

Es 436

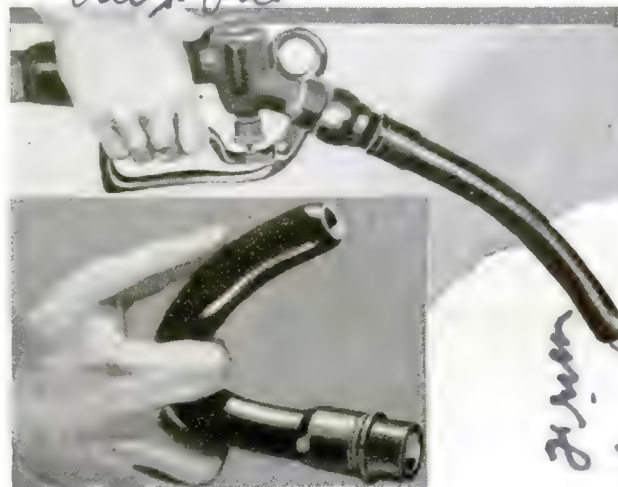
Hole Digger Enlarges Bottom for Concrete Work

Designed to facilitate preparation of post or pier holes for concrete foundations, a new tool enlarges the bottom of the hole, making it flat with slanting sides in bell shape. It operates automatically, with no triggers, trips or ratchets. Dropped into the hole, it reams the bottom to about four times its original area. The tool may be obtained for any size hole and the handle adjusted to any depth.



Flexible Nozzle of Gas Hose Made of Synthetic Rubber

Nozzles for gasoline hose are being made of synthetic rubber to eliminate the hazard of scratching fenders and cut down the drip loss. Tanks can be filled quicker, too, since the flexible nozzle adapts itself to the curves of the tank spout and can be thrust far down.



Synthetic rubber nozzle for gasoline hose adapts itself to spout of tank and avoids scratching car

Es 528
Sates Rubber Co.
999 S. Broadway
Denver Colo

H. E. Price. 39 W. 4th Ave. St.

Uninjured at Mellon Institute. Call Stoughton P.A.
Cramer & Co. 4319 Main St. Dallas, Tex.

Alex. Fild
"The whole of auto supply & trucking"
2121 W. 1st Ave.

Serene Serna 5/6/37

es 482 Cont. Thomas L. Shafer

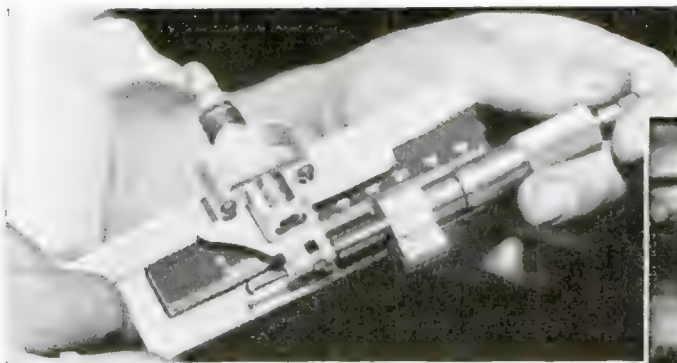
POPULAR MECHANICS

235

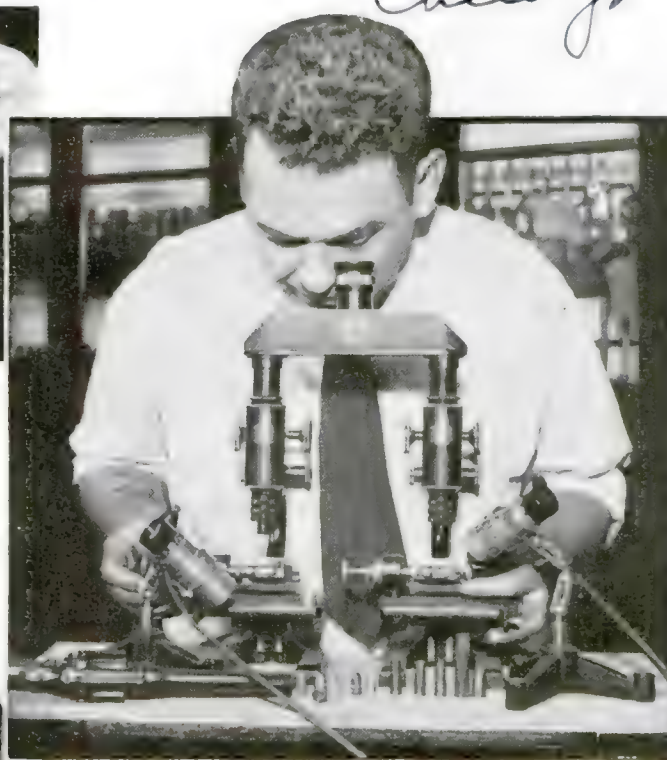
7826 S. Honore St.

Latest Scientific Tools Aid Crime Detection

Chicago



Science's latest tools for crime detection include the variable stage micrometer (above), used for measuring bullets and for other purposes. It is accurate to .001 inch



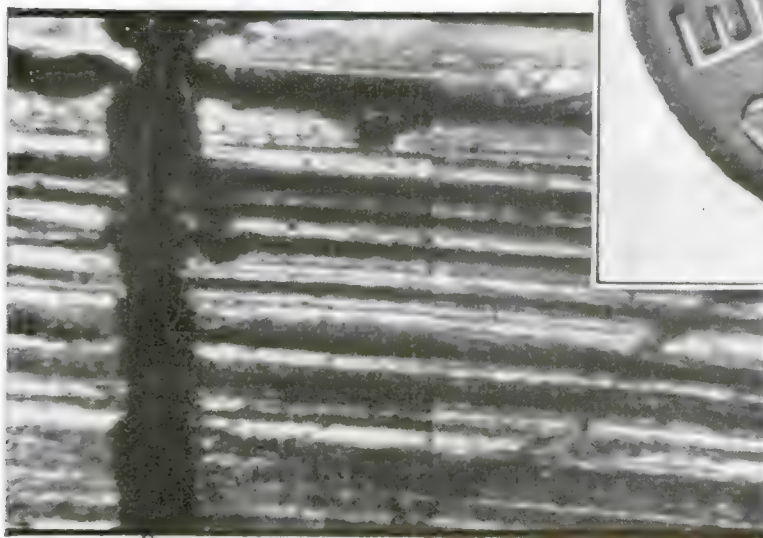
Above, new microscope for comparing bullets, shells, cloth and plaster. Also equipped for examination of blood and bloodstains, it aids crime detection by means of comparative photomicrographs



Above, fuming document with sulphocyanic-acid vapor to restore erased writing. The erasure shows as blood-red coloration after vapor treatment



Left, photomicrograph of matched bullets. Note line of demarcation down center where two photos were fitted together, showing that the bullets match, therefore were fired from same weapon. Above, comparative photo of two shell heads, taken through the comparison microscope and camera. This shows similarity after shells have been fired

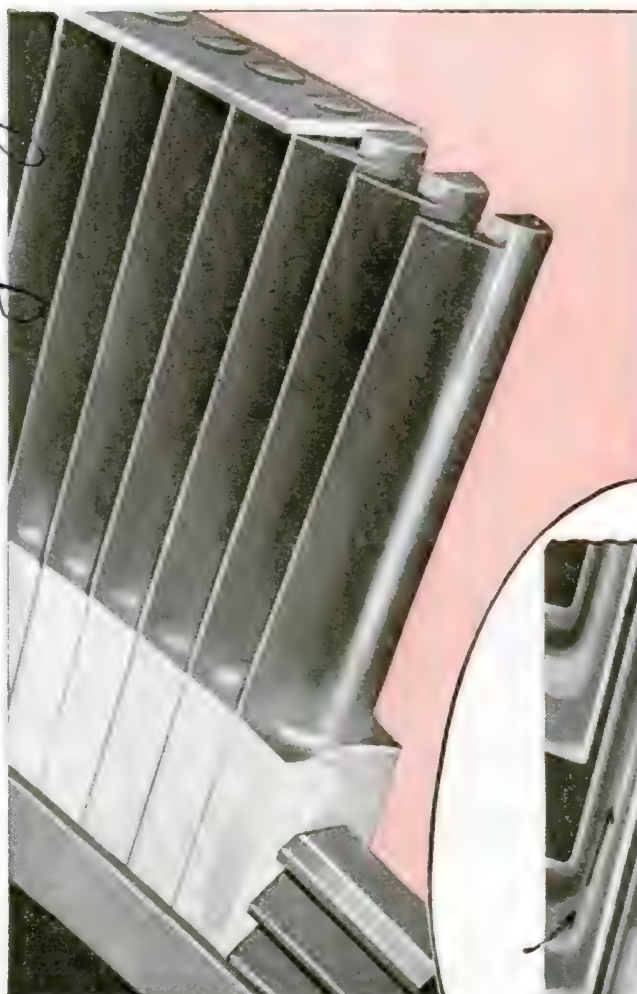


Science Crime Detection Laboratory
Northwestern Univ. School of Law

469 E. Ash St. Chicago

General Electric Co. Schenectady, NY

20 402.1213. 2 1/2 inch dia 2 1/2 inch



SUPER-

steel. But the stretch of turbine steel must be held to the merest "creep." A turbine may change size as time goes on, provided such changes are symmetrical and uniform, but the changes must not exceed about one part in a thousand. And this must apply not only to the shell and blades, but in the same degree to pipes, flanges, bolts and nuts—all parts reached by the hot steam and hence under stress.

In the turbine factory of the General Electric company, for example, are automatic electric furnaces held at temperatures higher than those which occur

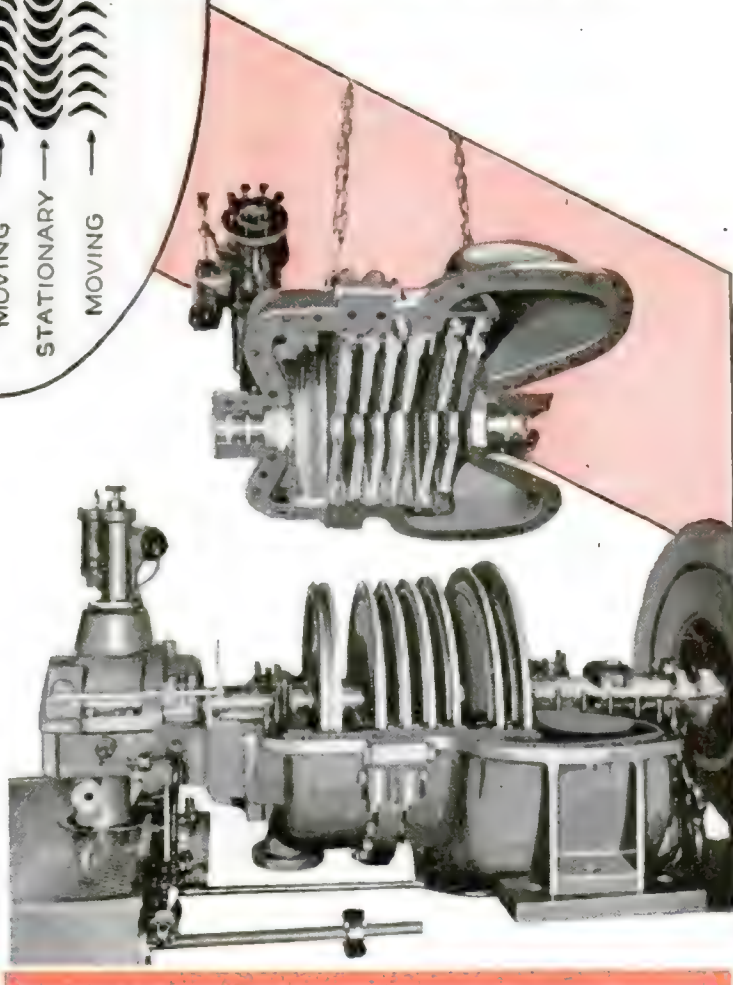
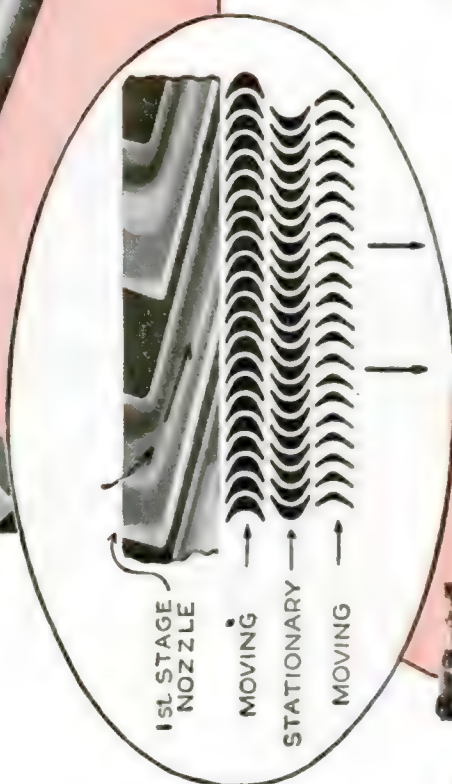
By
Charles M. Ripley
Electrical Engineer

Part II

A MODERN turbine run by superheated steam is subjected to pressures equal to those half a mile down in the ocean and to temperatures which would melt tin, zinc, lead and tellurium. And inside its almost red-hot shell, spinning at whirlwind speed like a huge top, is a rotor weighing perhaps twenty tons.

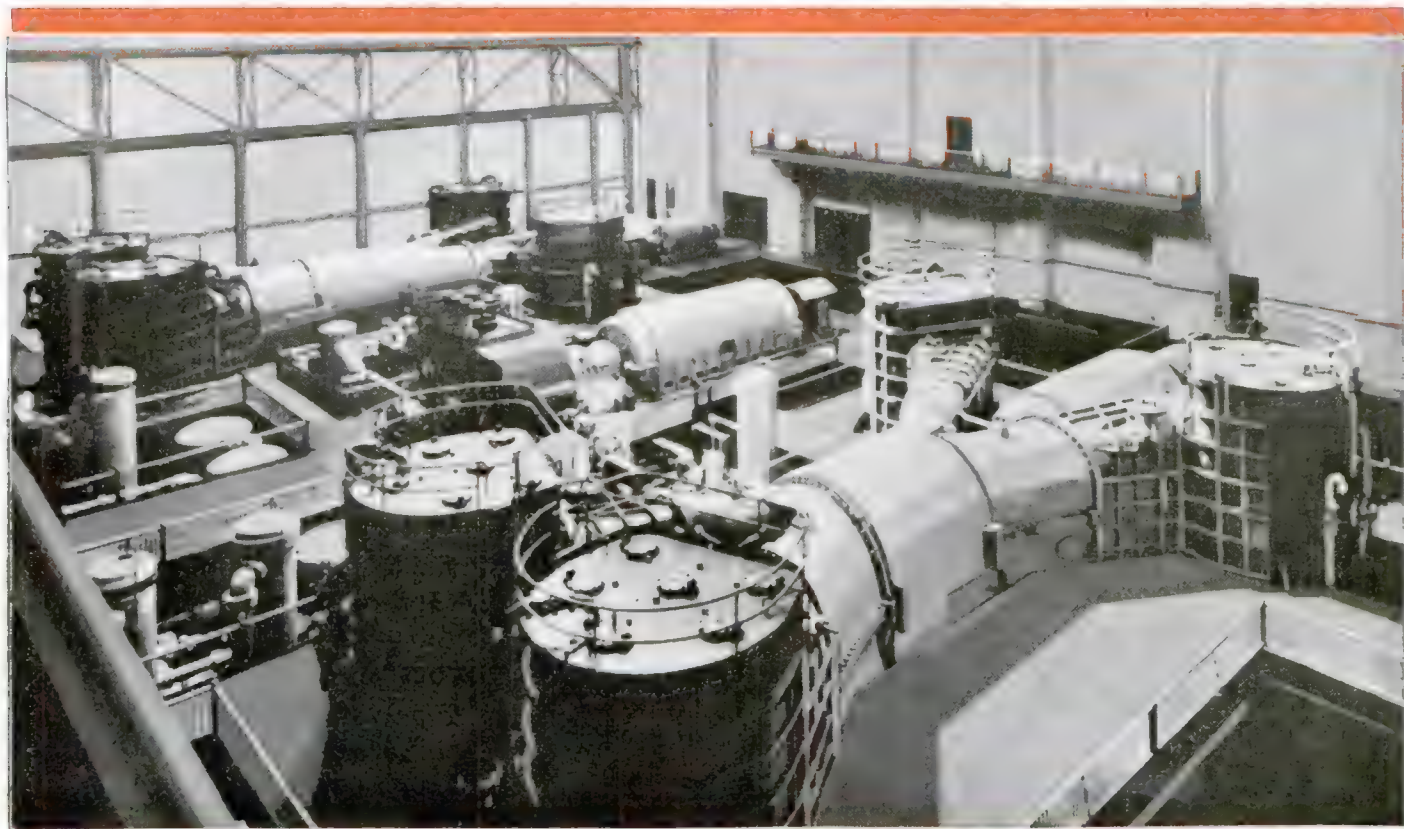
But the top spins true and the shell does not leak, despite the enormous pressure and terrific heat, because man has developed metals which can withstand the grueling punishment meted out by super-steam. Turbine materials are tested for years at a time and changes of even one part in a million are recorded and studied to be sure the metal can "take it."

Heat softens metal just as it softens molasses candy. And just as the candy stretches when it is pulled, so does the



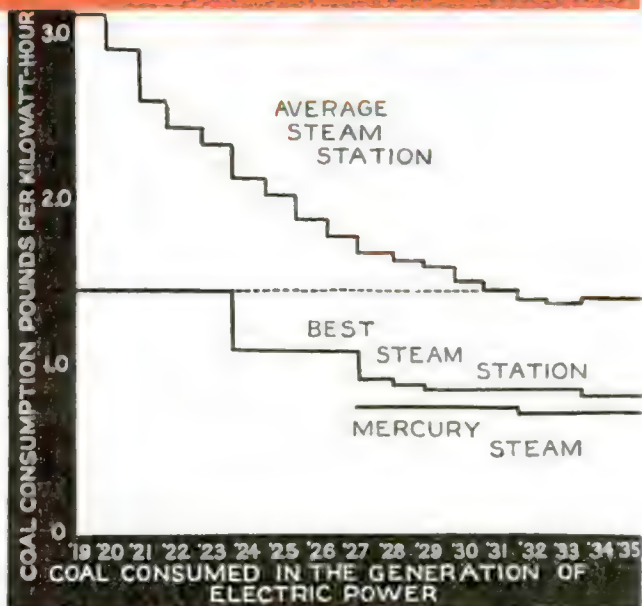
Photos Courtesy General Electric Co.
Top, buckets attached to rim of steam-turbine wheel.
Center, diagram showing steam path in turbine.
Bottom, condensing steam turbine with upper half of casing raised to show the wheels turned by the steam under pressure

STEAM... *An Amazing* STORY of ACHIEVEMENT



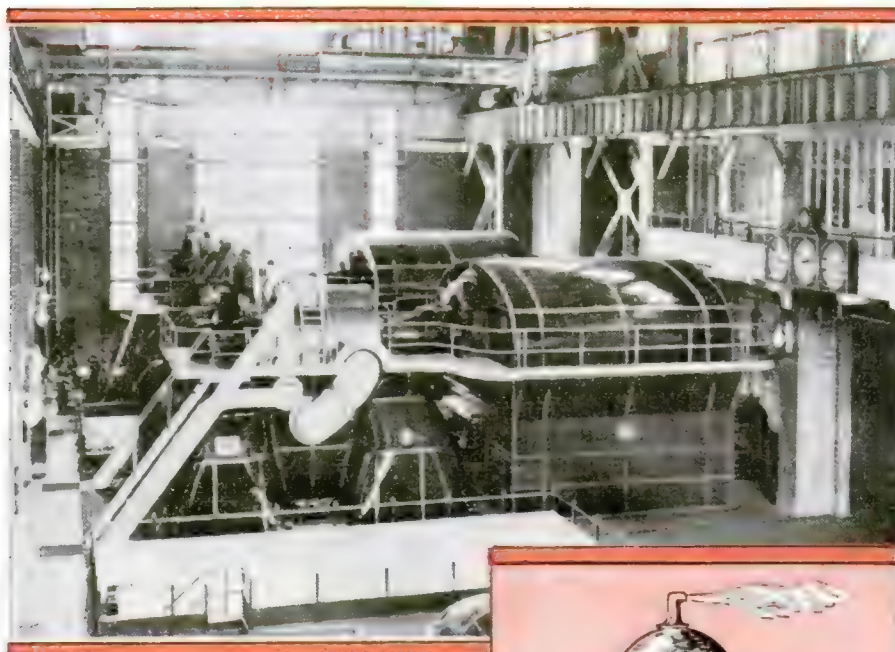
in turbines. In them rods of turbine materials, under constant tension, are tested for years at a time and gauges indicate changes in rod length of one part in a million. Thus, watching the "creep" of these heated and stressed rods day after day and week after week, test men determine surely in a short time what may happen in a long time and are able to select only steels certain to maintain their shapes and dimensions within allowable limits during the lifetime of the turbine. And some designers fix the allowable rate of "creep" at one one-hundredth of one per cent a year—very little stretch indeed.

There's plenty of reason for all this meticulous testing because there's just as much difference between ordinary steam and super-steam as there is between low voltage and high voltage. A construction gang once heard a squealing noise and found it was invisible super-heated steam escaping from a leak in a pipe joint. The



The 208,000-kilowatt, three-unit turbine-generator set of the "State Line" station at Hammond, Ind., and chart showing how coal consumption per kilowatt-hour is decreasing

men placed an oak plank four inches thick against the leak to divert the steam from a switchboard in the same room. When



The Ford Motor Company's 110,000-kilowatt, vertical-compound steam turbine generator sets

they returned next morning, they found a hole burned clear through the plank—a hole burned by invisible steam. You can't take chances with steam like that.

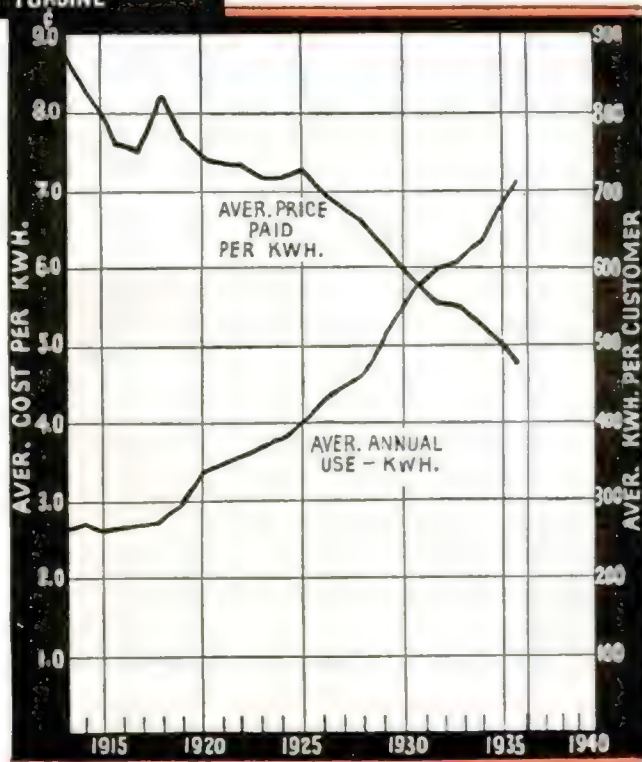
When engineers discovered super-steam enabled them to extract twice as much electricity from each ton of coal, they began building super-turbines—literally piling one turbine atop another. This is known as "superposing" and an example is the latest 110,000-kilowatt turbine at the Ford plant. It occupies a floor space of twenty-two by sixty-two feet and is about twenty-five feet high—just about the size of a six-room house. It is really a double turbine for one is set on top of another. The exhaust steam, after making power in the top turbine, goes into the lower one without reheating, and there it makes more electricity, then passes to the condenser. So two turbines and two generators both make electricity with the same steam, producing a kilowatt-hour for less than one pound of coal. By this superposing, one plant doubled its power output with only two per cent more coal.

One of the biggest turbines in the world is in the Chicago district, the State Line plant on the shore of Lake Michigan. It has a capacity of 208,000 kilowatts or 277,000 horsepower. It would require

more than 3,200 automobile engines of eighty-five horsepower each, running at full capacity, to equal the power of this one turbine and these cars, placed end to end, would extend almost ten miles. This turbine can't think but it can do the muscle work of more than 2,700,000 men. But the turbine works twenty-four hours a day and men can't. So it can do the muscle work of more than 8,000,000 men working in three eight-hour shifts.

In 1936 more than 68,000,000,000 kilowatt-hours were produced by steam in the United States. This represents the muscle work of more than 300,000,000 strong men—more than twice the population of this

(Continued to page 130A)

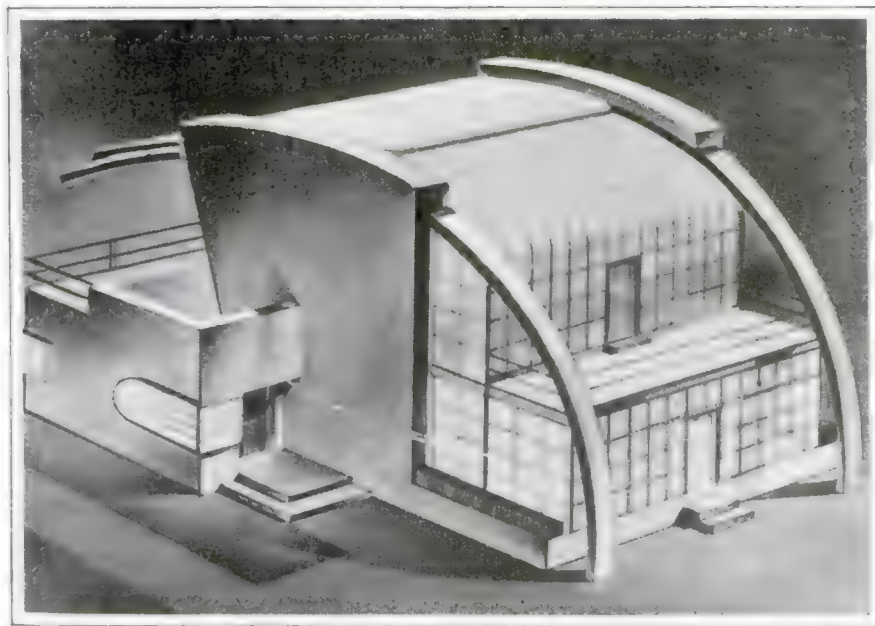


USE OF DOMESTIC ELECTRIC SERVICE AND ITS PRICE AS COMPARED WITH COST OF LIVING TO SEPT. 1936

Hero's turbine of 120 B.C. Chart shows how cost of electricity has declined as consumption increased

Glass Roof, Sliding Cover for Future Homes

Admission of more light to the home, office building and factory is being achieved through the increasingly liberal use of glass. Many industrial structures, as well as residences, now have entire walls of glass. Materials are on the market for erecting buildings almost wholly of glass, either in the form of brick or double panes. Such buildings would have supporting members of steel, therefore would be substantial. Not far in the future are homes like the one presented recently in sketch form. The design calls for glass walls and roof, to admit light and radiant heat from the sun, and for a sliding cover. In winter the cover would be rolled back to let in the sunlight; in summer it would be rolled forward to shield the glass roof from the sun. Operated by motor, the roof cover is re-



Courtesy American Radiator Co.

Sketch for a "Home of the Future" into which radiant heat from sun would be introduced by means of glass roof and walls

garded as practical. It would be moved by rollers, or other means, in two channels, one at either side of the house, running over the roof in a graceful curve. The movement would be similar to that of a roll-top desk. When rolled back, the roof would serve as a cover for a porch in rear.

Sheepskin Mitten Does Double Duty in Cleaning Auto



Here is sheepskin mitten being used in cleaning car. Its size speeds up work

Doing the work of sponge and chamois in washing automobile or truck, a sheepskin mitten now on the market protects the hands from dirt and dust and from scratches. It does a thorough cleaning job when used as sponge in washing the car. After the mitten has dried it may be used as a duster. The mitten is chemically treated to eliminate use of a chamois after washing and is process tanned to withstand water. It will not injure paint and will not hold sand, gravel, grit and dirt during a wash job. The mitten also may be used for dusting venetian blinds, furniture, floors, painted walls and woodwork and for waxing and polishing.

Motorists will soon be able to drive from the English Channel to Istanbul on a paved highway 1,940 miles long; it is already completed as far east as the Hungary-Jugoslavian border.

Winchester Products Co. Joplin, Mo

Compressed Air Magazine. April 1927

575

Chrysler Corp

341 Massachusetts
at the Plymouth factory,

Therapeutic Lamps Bake Paint on Modern Autos

see April 1938



Battery of paint-baking lamps trained on hood of car in factory. This system permits accurate control of the temperature

In the same way that therapeutic lamps bake parts of the human body to relieve pain, so does a new drying lamp device bake paint on the modern automobile to assure a uniform finish. The lights are installed in a "hot house" at the end of the assembly line. Mounted on flexible standards to permit focusing the beams on any part of the auto's top or sides, the lights are installed in units, each containing two banks of lamps set in reflectors resembling the photoflood banks on motion-picture sets. Unlike the movie lights, however, these lamps throw heat instead of light. The twin banks contain twenty therapeutic bulbs, of 260 watts each, to produce heat up to 250 degrees, the same intensity employed in body-plant baking ovens. Twenty-five minutes under the lamps is the usual treatment for each car. The system, now in use

permits perfect control of baking temperatures. It also makes possible the baking of certain portions of the surface when special color combinations are ordered. Thus, it becomes unnecessary to send the automobile through the big baking ovens to harden a small area painted or striped an individual shade.

5517

Offset Propeller Reduces Wear by Vibration

Two-blade propellers offset at the hub, acting as a flywheel and thus eliminating much vibration, are being introduced to the aviation industry. The blades, with a decided arc, take a larger

"bite" of air and direct the air stream at a sharp bias under the body of the plane, giving it added buoyancy. It is claimed for this type propeller that it offers ten per cent better air speed and climb, quicker take-off, and lowers the engine temperature thirty to forty degrees, with a consequent reduction in lubrication costs.

Luigi Pierino De Cesare



Quicker take-off and greater speed and climbing power are claimed for this new type of airplane propeller with two blades offset at hub

Propeller Corp.
Milwaukee, Wis.
Maynard & Li Cesare
27th at W. Dakota

575

2046

Boeing Aircraft Co.

POPULAR MECHANICS

241

200 W. Michigan.

Three-Deck Sky Clipper Has Aisle in Wings

Seattle Wash.



Destined for non-stop transatlantic service, this four-engined flying boat has cabins on three levels for passengers, crew and cargo. A companionway in wings gives access to the motors

Can American Airways

Three-deck flying clippers with seats for seventy-two passengers and a crew of eight or nine are being built to span the Atlantic, non-stop between New York and London. So vast are the wings that there is a full-length companionway giving mechanics access to the four engines during flight. The ships will weigh 85,000 pounds and be capable of cruising 5,000 miles at

150 miles an hour, with 200-mile top speed. The fuel capacity is 12,000 pounds, but with a full gasoline load the clipper will not carry its top capacity of seventy-two passengers. The hull, 110 feet long, is being divided into three decks, the upper deck for crew, the middle for passengers, and the lower one for heavy cargo. Each motor develops 1,500 horsepower.

Flexible Track for Toy Trains Curves in Any Direction

Miniature railroads can be laid out with great freedom by using a flexible track that curves in any direction. Available in rolls consisting of a four-foot and a six-foot section, this "third rail" electric track snakes and climbs around the mountains

and valleys of the toy railway system, adapting itself readily to any contour. It is of standard size and connects with switches and crossovers, as well as with the conventional type track. Natural wood ties give it a realistic appearance.

Flexi-Track



Flexible track for toy electric railroad comes in rolls and can be curved in any direction

Parfait Products
1500 N. Ogden Ave
Chicago

Is 508

Epsom Salt Kills Grasshoppers When Mixed with Bran Bait

Epsom salt is bitter medicine for man, but it is deadly poison to grasshoppers. Two University of Oklahoma scientists discovered this recently, and found that a bran bait prepared with bran, molasses, Epsom salt and water was more effective in killing grasshoppers than the standard arsenic bran bait.

Hubert W. and Mabel
J. J. J. J.
(formula on supplement)

not in
second
day (1929)

es 478

magee

SNAPSHOTS

Eastman Kodak Co. 343 State St. Rochester, N.Y.



Camera pointed downward catches most of boat crew at left, while girl in canoe is seen from an unusual and interesting angle

PPOINT your camera straight ahead, push the button, and you get—just another picture. Take that same scene, but play the angles—and you may have a prize-winning shot.

Did you see that fellow crouching down behind the streetcar, squinting up at the conductor as he leaned from the back window to pull the trolley? He wasn't playing a game. He was after an angle shot with his camera.

It's too easy to get into the head-on habit, to take a picture that is a record, but nothing more. Don't fall into that rut. Camera fans are learning that there are interesting pictures in the most common-

place objects, if they play the angles. You wouldn't pick the broad side of a streetcar as a worthy object for snapshooting. But look down on that car from a skyscraper window just as it turns a downtown corner, boring a hole through a solid mass of shoppers, and you may catch a distinctive

picture. The fellow who snapped the conductor silhouetted against the sky as he hauled in the trolley rope turned a commonplace event into a story-telling scene.

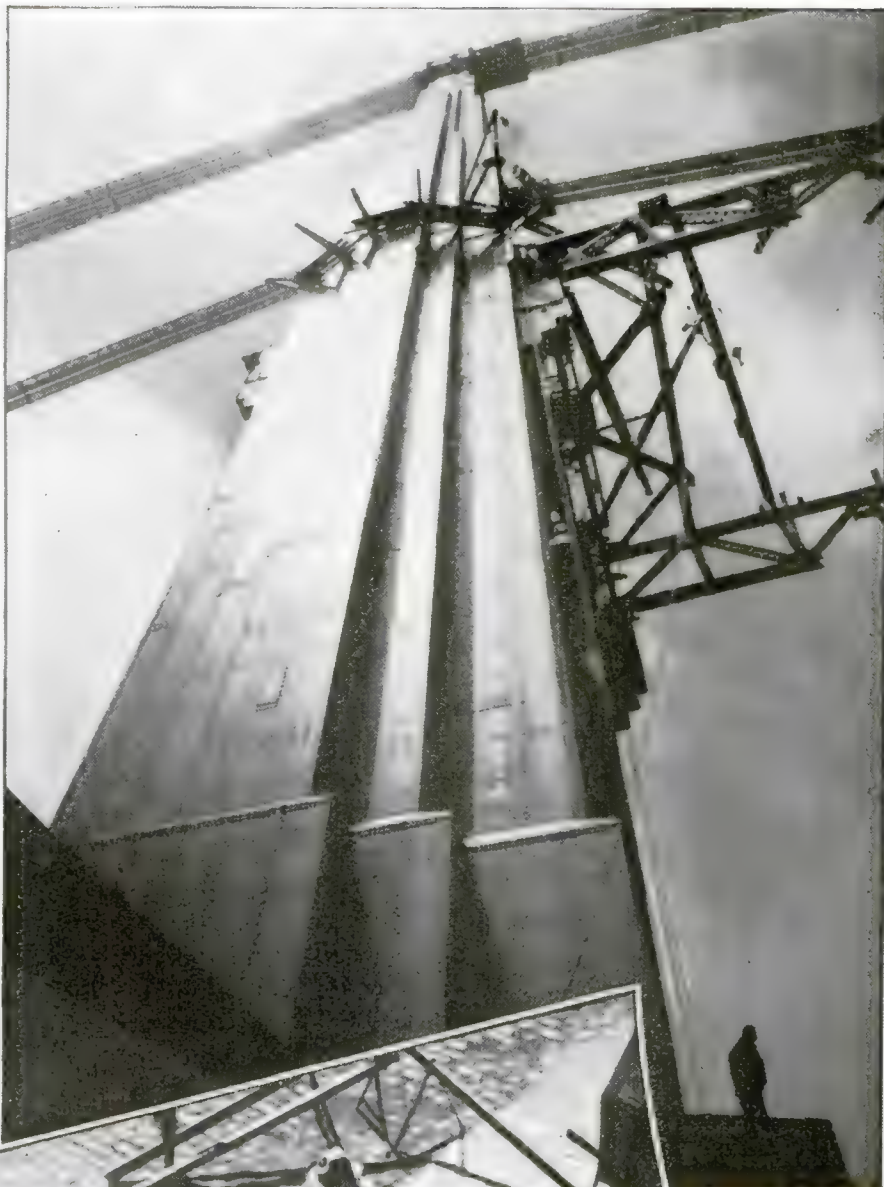
Look right in your own back yard. Wash day may seem quite unexciting, but get your camera down on the ground and turn it skyward as they hang the clothes on the line. If there's a parade in town, pick out a vantage point along the line of march and film it from curb level. Men seem like giants to the low-placed eye. Tramping feet march right into the camera. Go to the racetrack and shoot from the level of those pounding hoofs. The low angle magnifies the exciting action.

from NEW ANGLES

One of the commonest angle shots is the skyscraper, taken straight up from the sidewalk. You have seen those pictures. The tall buildings appear to be leaning backward, toppling from their foundations. Such pictures are either striking patterns or merely bizarre distortions. If you like them, fire away.

Sports photographs are lifted from drab to dynamic by the right slant. Swimming pictures are better if the camera is at a high level and you focus down on the subject. From there you catch the light playing on ripples of water, and the swimmer's form is less distorted than from the side. Stoop below the pole

Dramatic view from below the 746-foot main tower of Golden Gate suspension bridge, and a street-paving gang from a high window. (Photo at right by Orville Logan Snider)





vault standards and catch the athlete against the sky. Snap the hurdler from ground level. Drop behind a tennis net and click the shutter as a fast drive comes at you. Aim downward at figure skaters whirling around the ice. Two good angles for football pictures are the "aerial" view, with the camera pointed downward so that each player is a dot on the field, and the shot from low at the end of the line as the teams face each other ready for action.

There is no particular trick about angle photography. Camera mechanism has little to do with it. True, you must remember to shut the lens down a stop or more if your aim happens to be against a bright sky or water reflecting light. But the real trick is in you—your ability to see the fresh slant on the ordinary scene.

Machinery lends itself to extraordinary angle shots. Focus on the wheels of a locomotive from track level and observe how the power of those giant wheels is intensified! Stand close to a great fly-wheel, look up from the foot of a lofty dam, peer down into the engine room as the fireman shovels coal into a furnace.

Realistic pictures of table-top models depend largely upon the point of view.

Aim down at a model city or contour map from the proper distance above it and your picture may appear to be an aerial photograph. On the other hand, for a lifelike photograph of a doll house or an architect's building model, set the lens at "doll's eye" level.

Street scenes—hurrying crowds, the repair gang at work, the traffic jam, patterns in pavement and streetcar tracks—are usually most striking from a high vantage point. Bridges offer rich opportunities for angling. Train the eye on the structural steel work for an effect of massive strength, or use that steel work to frame a river scene. The steel web of a suspension bridge is interesting from many angles. Stand on a bridge and catch a downward glimpse of a steamer gliding beneath, or fishermen in small boats, or a girl paddling a canoe. Climb into a switch tower or a viaduct for a different view of a busy freight yard or a speeding train.

Instead of asking friends to pose

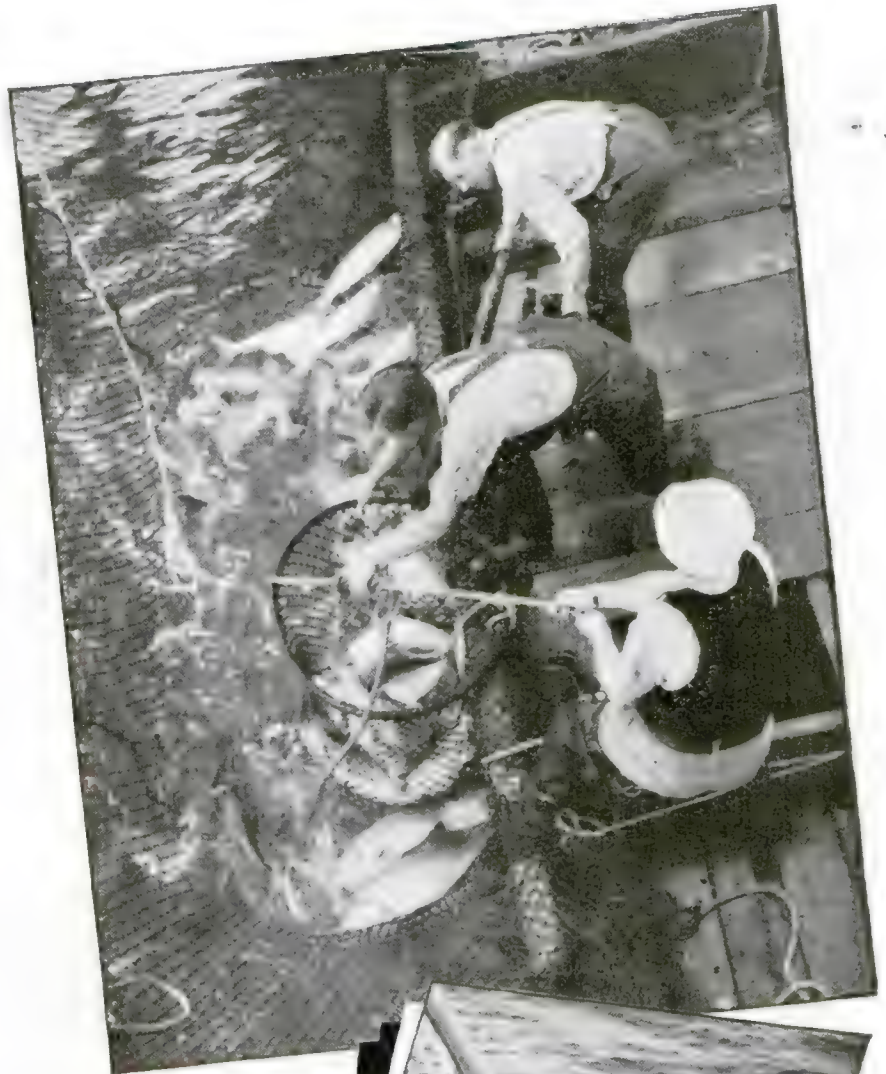


Above, the boat would be lost if this scene had been taken from dock level. Below, note impression of height gained by looking upward at men on girder

for you in the conventional, stiff way, catch them off guard from an upstairs window as they come up the walk. Point upward at a balcony or a dormer window; watch for unnoticed beauty in the pattern of a stairway and balustrade seen from above. At the seashore, snap that flock of gulls lined up on a roof top; in the country, swallows in dress parade on a telegraph wire. Lie down in a hay field with the camera close to the earth and "fire" through the big wheel as the farmer drives his rake abreast of you. At the airport, catch a grotesque upward view of the nose of a sky liner, its two lights like eyes of a giant bug.

You'll find yourself in ridiculous pictures now and then, but the results should pay! You need not always climb to a skyscraper roof or an upstairs balcony.. You can perch on a chair, a fence, or the top of an automobile, to gain perspectives that will make your pictures attractive and distinctive. All pic-

(Continued to page 116A)



Scenes on shipboard offer excellent opportunities for angle photography. Fishermen hauling in nets, crew loading naval gun and couple at rail of steamer all were caught advantageously from above

A. S. Lyndon

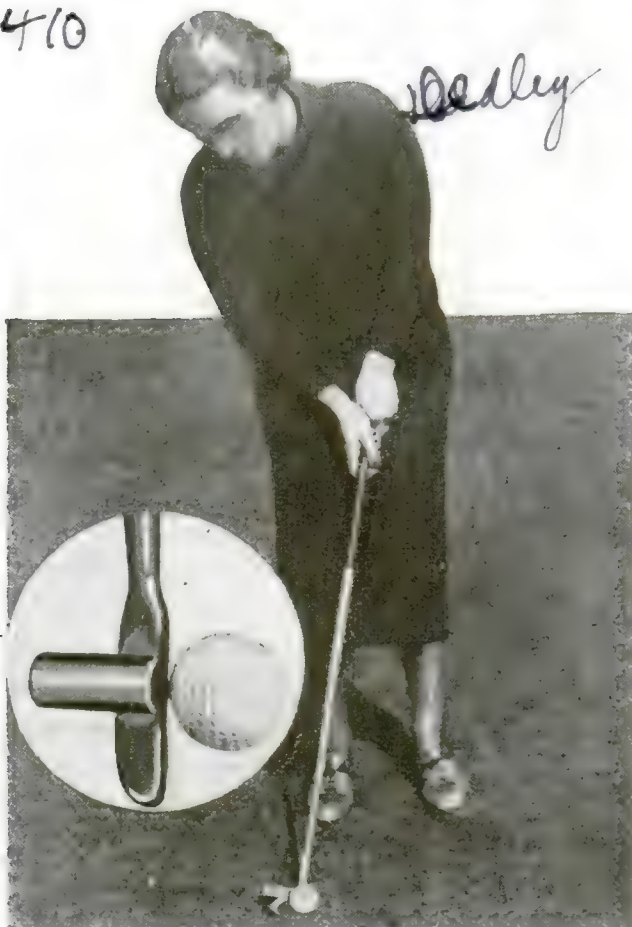
246

POPULAR

MECHANICS

Ann Arbor, Mich. Adjustable-Weight Putter Helps Line Up Stroke

Is 410



Putting with adjustable-weight club, which helps line up stroke. Lead slugs fit in cylindrical housing

Designed to improve accuracy on the green, a golf putter with adjustable weight is offered. The weight is varied by adding from one to ten lead slugs which fit in a cylindrical housing directly behind the point of contact with the ball. The cylinder, being at right angles to the club face, helps in lining up the putt.

Is 526

Reduction in Pneumonia Toll Promised by Chemical

Successful warfare against pneumonia is being waged with the aid of a chemical called hydroxyethylapocupreine. It is one of the seventy-six chemical preparations based on quinine which were synthesized by a Mellon Institute laboratory staff and then tested on mice, rabbits and dogs to determine whether they should be tried on human cases. In 100 pneumonia cases treated last winter the mortality was twenty-seven per cent, compared to a

Announced by Dr. William
Es. MacLachlan, M.D.
Hospital, Pittsburgh, Pa.

Science Service. 5/4/37

normal mortality of about forty-five per cent for 100 non-specifically treated cases. Apparently the preparation may reduce the number of deaths by half. The chemical is swallowed in capsule form, as though it were quinine. The doses are unusually large, 400 to 800 grains or even higher during a week's time. In cases of pneumonia for which there is no serum the chemical is effective. Hydroxyethylapocupreine also is useful in treating empyema, one of the common complications of severe pneumonia infections. Doctors who have used the remedy warn, however, that the chemical has no beneficial action on influenza and streptococcus infection.

Is 490

Flutelike Instrument Helps Beginner Learn Music

Resembling the end-blown flute of Shakespeare's day, a simplified instrument is aiding in the teaching of music. Easy to blow and to finger, it provides elementary training in reading music without the technical complications of standard instruments. It is equipped with a mouth-piece fashioned from a new thermoplastic material by means of a hydraulic injection process. The instrument has a clear flute-like tone and covers a range of nearly two octaves upward from middle C, controlled by only six finger holes.



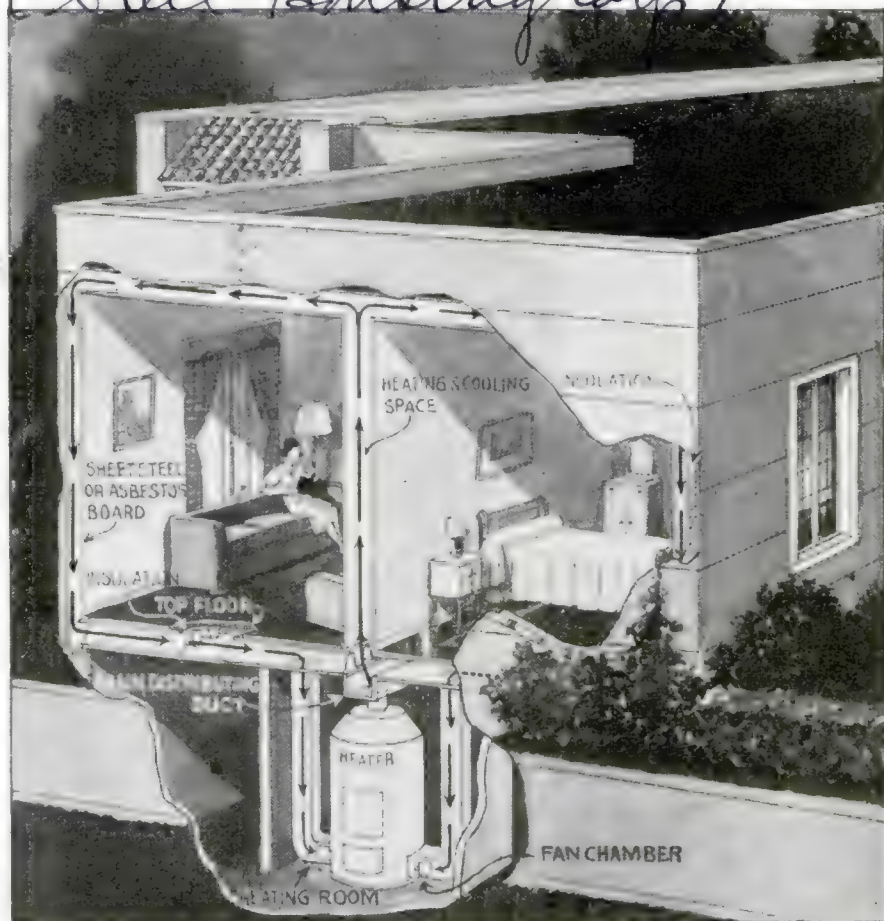
Teaching elementary music with aid of instrument resembling the flute

Saxette Co.
Cleveland, Ohio

Radiant Dual Walls Heat Home or Cool It

228 N La Salle Chicago.
Steel Housing Corp.

Abandoning the traditional method of heating, a construction company is building homes with dual walls that are radiators in winter and cooling areas in summer. There are no conventional radiators or warm-air registers. Instead of heating the air, the walls and ceiling are heated, and it is claimed that the house heated by radiation to sixty-five degrees Fahrenheit is as comfortable as the house heated to seventy-five degrees by warming the air. The engineers say, too, that radiant walls retain their warmth longer thus saving fuel. From the basement heating plant, warm air rises between the inner walls to the ceiling, flows across the heating space above the ceiling and is drawn down the



Arrows trace movement of warm air up through dual inner walls, across ceiling and down outer walls, returning to furnace for reheating

outer walls and beneath the floor to a return duct for reheating. Outside walls are insulated against heat loss. Between outer and inner walls is a three or four inch

space for the sealed air circulation. Inner walls are radiating surfaces of steel or asbestos board. The same air passages are used for circulating cool air in hot weather.

Es 330 "Straphanging" Firemen Ride Behind a Windshield



Trying out the latest fire engine. Note straps to which firemen cling. Windshield gives protection from weather

Equipped with a windshield to protect firemen holding to hand straps like those in subway or trolley cars, the latest New York fire engine has all the features for efficient fire fighting. The firemen are protected from cold and wind by the windshield, and the straps give them more security as the engine speeds through the streets. Each fire truck of the new design cost \$11,765.

When you wish to know more about any article in this magazine, write our Bureau of Information, inclosing return postage.

Fire Commissioner Mc Elroy
Capt. Herman J. Kueh

Target Tells Which Ring Bullet Has Struck

American Connection was there



Target showing bullet hit the eighth ring from outer rim. Inset shows oscillating rings behind target

Throwing out a large metal plate bearing the score, an automatic target tells instantly which ring the bullet has struck. The rings around the target disk are numbered from one to ten toward the bull's-eye. Each ring is divided into four segments. If a bullet hits the fourth ring in the upper left quadrant, a metal plate showing the figure "4" is ejected at the upper left corner. A bull's-eye is indicated by the number ten at the top center. Oscillating steel rings behind the cardboard disk actuate the number plates when struck. The shooter replaces the score plate by throwing a lever.

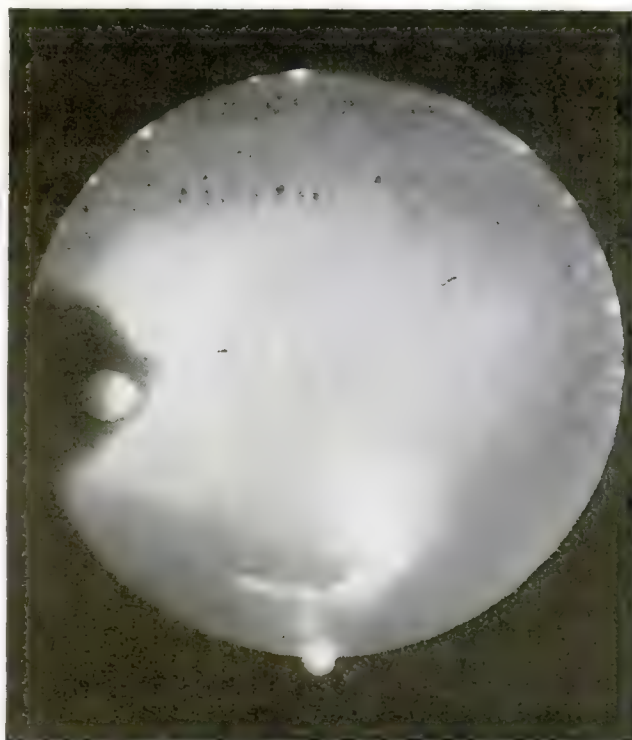
No More Drought Until 1975 Is Long-Range Forecast

Drought years in the United States will end soon, not to return until 1975. This is the long-range weather prediction made by Dr. Charles G. Abbot, secretary of the Smithsonian Institution, and based on a

study of the twenty-three year cycles in solar activities and earthly weather. He expects recovery from drought conditions in the northwest within a year or two, but severe recurrence of them after 1975, the end of a double cycle that began about 1929. Regular occurrence of twenty-three year cycles has been noted in tree ring and similar cycles occur in variations of Great Lakes levels.

Flares Carried by Pilot Balloon Show Drift of Night Winds

To chart the direction and velocity of night winds above the earth, a method of photographing the weather balloon by means of magnesium flares has been developed at Massachusetts Institute of Technology. From an observation point on the earth, a special 180-degree camera lens is pointed upward, taking the entire sky into its vision. As the sounding balloon rises and drifts, the flashes of magnesium flares attached to it and lighted at known intervals are registered on the photographic plate. By measuring the angles between the camera and the various positions of the flashes, the winds can be accurately charted. Tests of this method have recorded the flashes of light seven miles away and more than 13,000 feet high.



String of lights near bottom of this night sky photo shows position of drifting weather balloon

Washington, D.C.

*Harv Johansen Metal Works
Battensburg, Eder, Germany*

Swen Service 4/26/37

Meteorological Laboratory

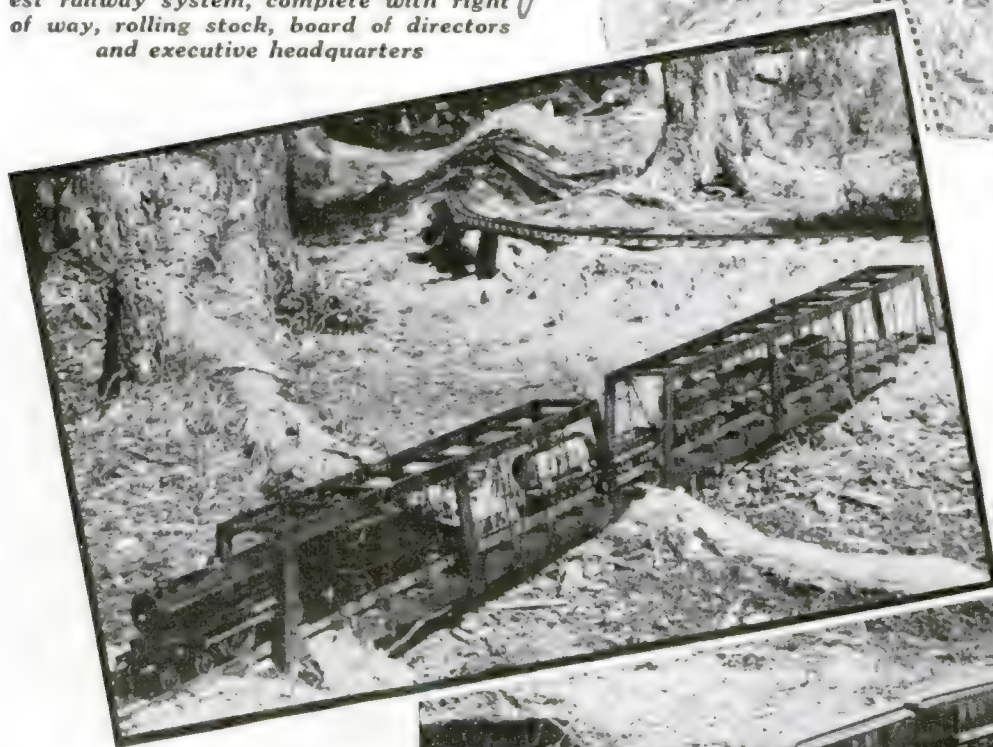
*Es 496
Es 497
Oceanographic Institute, Woods Hole*

Miniature Trains Run on Garden Railroad



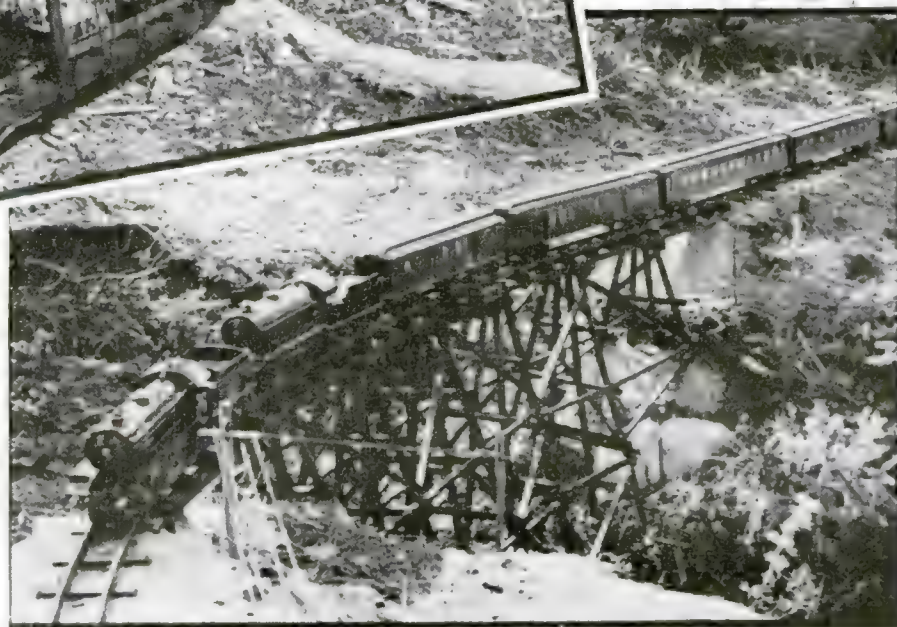
Courtesy Canadian National Railways

Here are several views of Canada's smallest railway system, complete with right of way, rolling stock, board of directors and executive headquarters



Center, how engineering staff solved problem of protruding tree root by spanning it with bridge over which midget train is passing. Bottom, "Tonquin Limited" passing over Maligne gorge trestle before ascending steep grade. Note that two locomotives are being used. The locomotives are built on English style and the system is equipped with both passenger and freight cars

Located in garden of Prof. William Rowan's summer home in Jasper National Park, the Lake Edith Railway company operates miniature trains. Top, left, double locomotives pulling train over "Athabasca viaduct." Right, executives supervising chief signal engineer on job



Small Diesel Tugs Do Work of Big Steam Craft

New Orleans, La.



and of providing the helmsman with control over the power and the direction of the craft. The simplicity of the Diesel makes possible a pilot-house control on the engine, which aids materially in fast handling of the boat. The result is a highly maneuverable tug, shorn of all unnecessary weight. Thus the new tugs, with only 100 to 125 horsepower, can out-perform more powerful, but much heavier craft.



One of the midget Diesel-powered tugs which are beginning to appear on inland waters. The craft is of welded steel construction

Small Diesel-powered tugs, capable of doing the work of steam tugs twice their size, are making their appearance on American waterways. The steam craft, because of their greater size, are harder to maneuver and their fuel costs are much higher. One of the midgets is the "Jeanne," said to be the smallest welded steel Diesel tug ever built. Her length is twenty-nine feet and her power plant is a lightweight Cummins engine developing eighty-five to 125 horsepower. Harbor and inland waterway tugs seldom require crew accommodations, which gives the hull only the functions of supporting the power plant

Fourteen-Mile Police Horn Is Used to Call in Squad Cars



Wine glass at the moment it was shattered by sound waves of powerful horn

Designed for calling in patrolmen and squad cars not equipped with radio, a horn with a fourteen-mile range is used by police in a California city. So powerful is the horn that its sound waves will shatter a wine glass held in front. Mounted on top of police station or automobile, the horn is operated by compressed air.

"Shadow Shading" Hides Planes from Foe Above or Below

British bombing planes are being "shadow shaded" to protect them from enemy eyes above or below them. This is a new

Chicago Daily News
5/8/37

Lawrence Products Co.
1221
1221
Los Angeles
Calif.

Curtin's Engine Co., Columbus, Ind.
Es 437

method of camouflage. The under surfaces are painted a dull black called "night," a color that absorbs light and will not reflect the searchlights hunting for them from the ground. The upper surfaces will be green and "earth" brown, to blend with the landscape when seen from pursuit planes overhead.

Window Washers on Radio While Working Far Apart



Window washer perched high on side of building in Chicago is photographed as he talks to another washer on building in New York

Truck Dump Body May Be Tilted Three Ways

Lending itself to being tilted to the rear, right or left, a new three-way dump body for trucks speeds up road building and similar work. Any of the three sides drops down when the body is tilted, or if the body is level all three sides can be laid flat, though road-clearance regulations prevent its use that way for hauling. It is not necessary to back up the truck to dump the load, the operator merely driv-



Unloading three-way dump body by tilting to left. Hydraulic hoist tilts the body

ing up to where he wishes to unload and pulling the proper lever in the cab, causing the body to lift at the side desired. The dumping mechanism is actuated by a hydraulic telescopic hoist.

Two window washers, one in New York and the other in Chicago, were interviewed and talked to each other by radio recently while perched on the sides of buildings in the two respective cities. Portable radio transmitters, attached to the back of each man, made possible the unusual meeting. One window washer was working on the side of New York's Empire State building, the world's tallest, and the other on the side of Chicago's Merchandise Mart, one of the world's largest buildings. The interview and exchange of comments by the two workmen were broadcast over a national radio hookup.

Paint for Use on Damp Surfaces Absorbs and Sheds Water

Paint, lacquer and varnish can be applied directly on wet surfaces by adding to it a special compound. The effect is to deposit the paint firmly on the surface, for the compound absorbs the moisture and then forces its way outside the film of paint, decomposes and evaporates.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

Commercial Shearing
and Stamping Co.
Youngstown Ohio

For White Motor Co 842 E.
Cleveland Ohio

Web X-1 Hale Paint Compound
Co. 572. Greenman, New York

NEW PROGRESS



Left, testing door treated with fire-resistant chemicals. Ability of timber to withstand strain is important because intense heat exaggerates faults. Right, fire-treated wall panel fails in oven test

By Charles Morrow Wilson

AS a building material wood has three great faults—it swells and shrinks, it decays and it burns. A method of sealing wood against the passage of moisture into or out of its pores virtually eliminates swelling and shrinkage, and modern paints, lacquers, varnishes and creosote materials reduce decay, leaving the third problem to be solved through some process for protecting wood against fire.

Wood chemists, technicians and amateurs are working on the problem and fire-resistant lumber, doors, casements

and other building materials already are on the market. Several American cities are requiring use of these materials in fire-restricted areas.

Scientifically, there is no such thing as a 100-per cent fireproof building material. Steel and iron buckle, twist, or break under fire. Cement, brick and stone expand and crack. Wood has the advantage of being a better nonconductor of heat and, as a rule, does not give way until actually destroyed.

T. R. Truax, chief wood technologist of the U. S. Forest Products Laboratory, Madison, Wis., lists about 160 different chemicals which help to make wood fire-resistant. Some are too expensive and many lose their fireproofing value when exposed to air and weather. In commercial fire-treating some of the proven chemicals are ammonium phosphate, ammonium sulphate and ammonium chloride, borax and boric acid. Many types of fireproofing treatments also protect wood against ter-

es 255 ne

in FIREPROOFING



The purpose of fire-resistant coatings is to retard spread of flame and to raise combustion temperatures so that fires cannot start from ordinary causes. The best use of fire-retardant chemicals increases ignition temperature by about 200 degrees Fahrenheit. Insurance experts estimate that such a raise in ignition temperatures might eliminate as much as seventy-five per cent of fire hazards in ordinary wooden dwellings, which regularly represent from thirty-three to fifty per cent of the total fire loss of the nation.

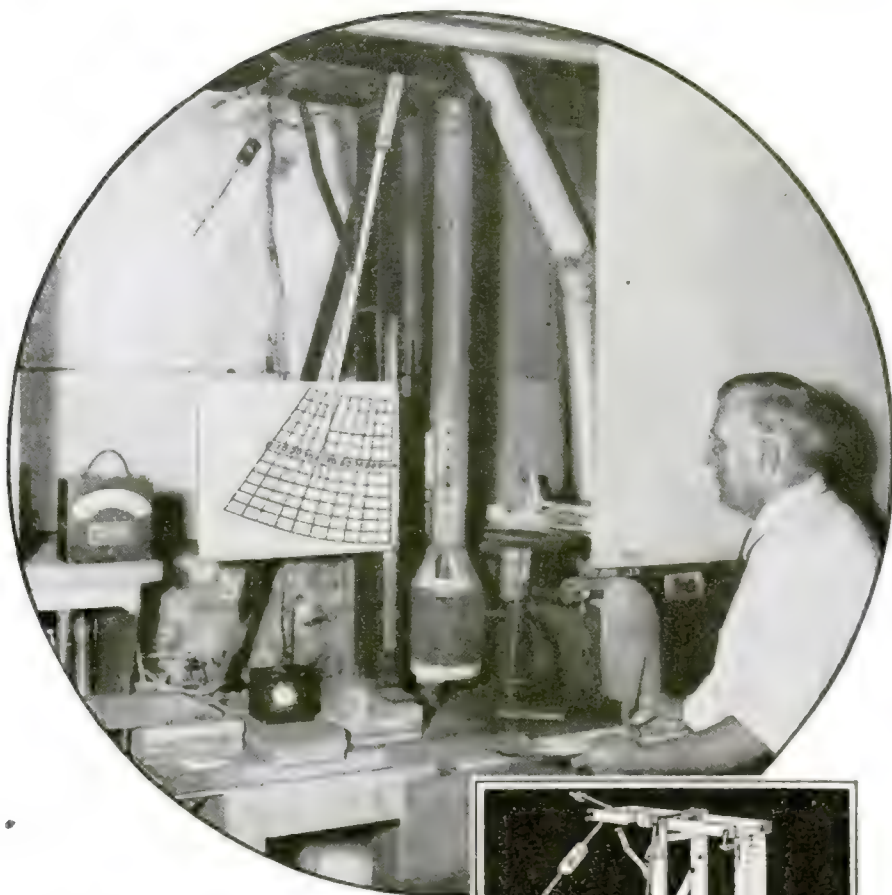
Fireproofing requires exact knowledge of how wood burns, and demands standard, accurate tests for fire-retardant

mites, other insects and fungi. This is particularly true of ammonium phosphate and ammonium arsenates. Zinc chloride, aluminum chloride, manganese chloride, nickel sulphate, calcium acetate, oxalic acid, and four sodiums, bicarbonate, silicate, chloride and sulphate, are others of the thirty-three chemicals commonly used.

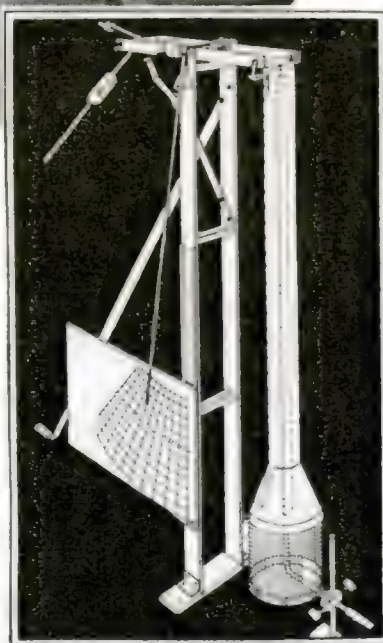
Early experiments depended largely upon surface coatings. The new style of treatment recognizes that although some types of surface coating serve to retard flame, saturation is the most effective; that is by soaking dry wood in a soluble which totals from one to eight pounds of chemical to the cubic foot of wood. Some students of fireproofing believe it soon will be possible to perfect a paint, which in addition to ordinary values may also serve to prevent flame spread. Several manufacturers are making final tests of such a paint.



Top, removing wall panel from oven. Bottom, electrical tester determines water content of wood. If wood is air-dry it can absorb satisfactory weight of fire-resistant chemicals



Top, fire-tube tester. Center, sketch of same apparatus showing outline of wood sample suspended in tube. Bottom, oven used to test fire-resistant qualities of wood



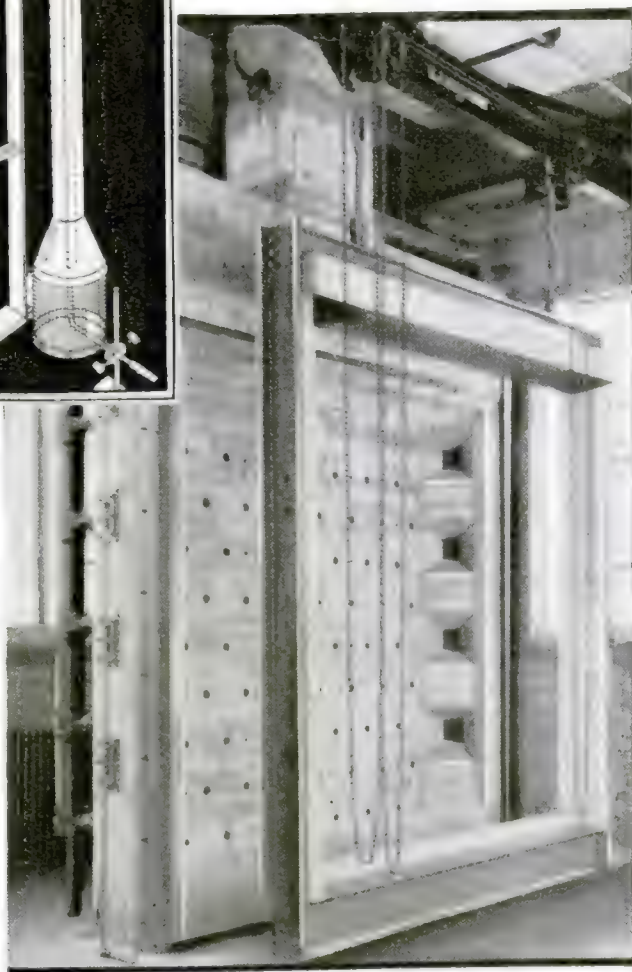
qualities. When subjected to high temperatures wood decomposes and gives off inflammable gases. Up to 212 degrees vaporization of wood moisture occurs. Scorching and slow production of inflammable gases take place between 300 and 400 degrees. Charring, with more rapid evolution of inflammable gases, glowing and then flaming occur between 400 and 700 degrees and quick ignition of inflammable gases and glowing of charcoal between 700 and 950 degrees.

Actual fire temperatures sometimes go as high as 2,000 degrees, but students of fireproofing are principally interested in the lower brackets of combustion. Suitable chemicals injected into or absorbed by the wood interfere with the process of combustion and may prevent it entirely. At present, no fire-retardants which can prohibit charring at extreme temperature have been perfected but fire-resistant

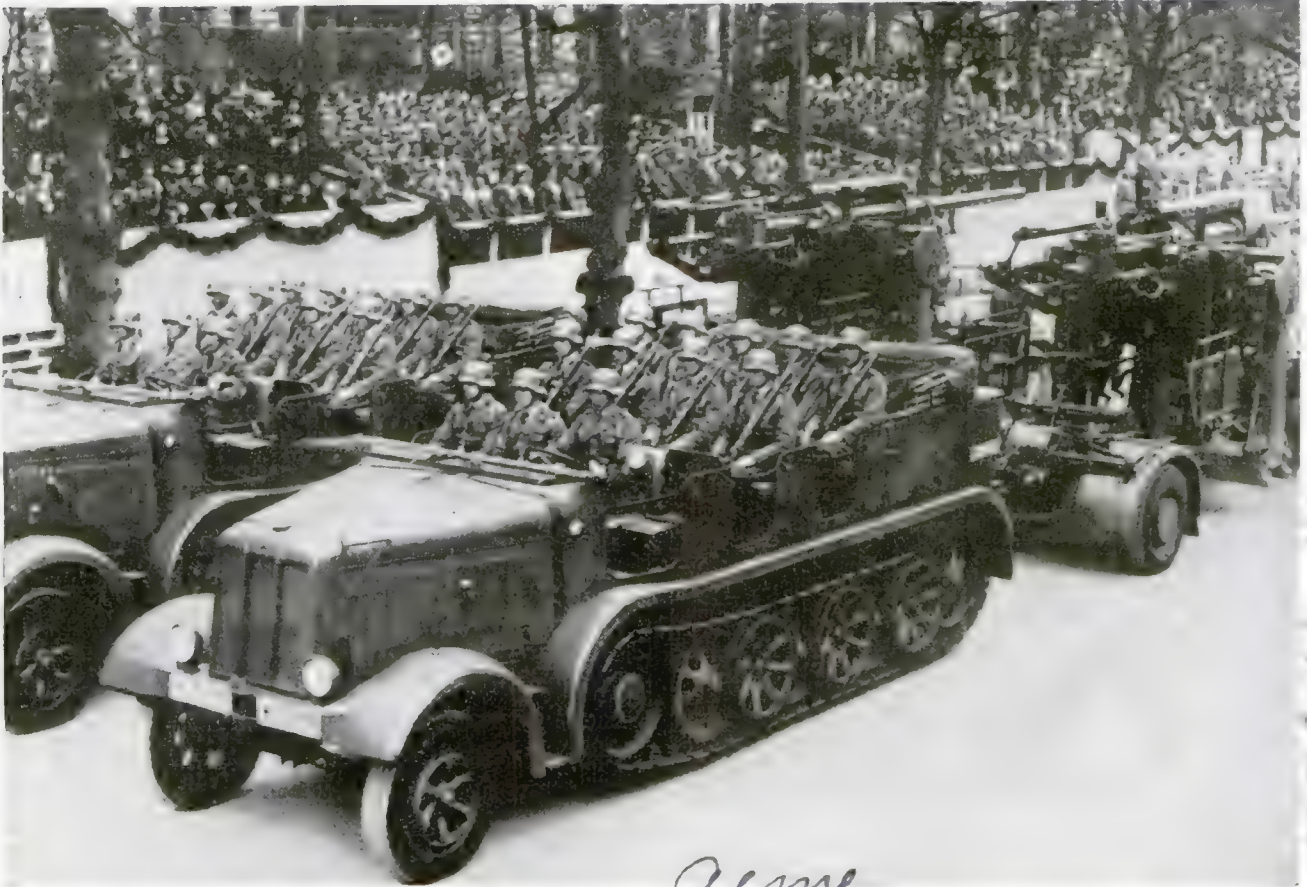
woods which will lose as little as fifteen per cent of original weight after long exposures to temperatures as high as 2,300 degrees have been developed. For all practical purposes such wood is fireproof. Fire-retardant treatments add to natural fire advantages of wood by increasing insulation properties, opposing flame spread and reducing its tendency to support combustion or build up high temperatures.

Many attempts have been made to measure fire-resistance of wood in terms of one or more of these properties. Some investigators have measured the volume and character of gases resulting from heating wood, or the temperatures of

(Continued to page 122A)



Tractors Haul Artillery in Mechanized Army



acme.
In a military parade in Berlin, these huge tractors carrying artillery troops and hauling big guns are seen passing the reviewing stand. Six hundred mechanized artillery units participated in the display

Giant tractors that carry twelve soldiers and haul big guns behind them are replacing horse-drawn field pieces in Germany's mechanized army. Formidable

weapons can be transported with great speed by these tractors. Six hundred motorized units participated in a recent military display in Berlin.

Artist "Paints" a Picture with Pieces of Printers' Type



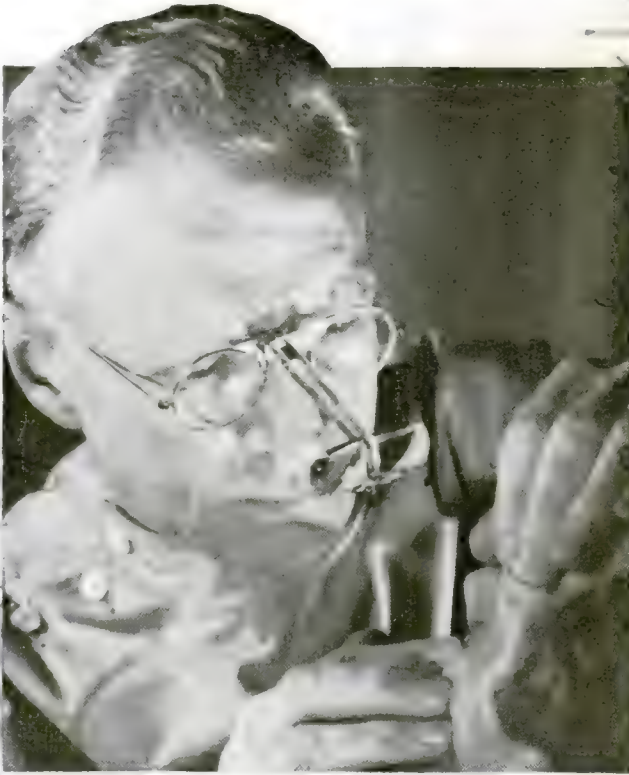
One of the costliest forms of art is that of creating pictures with printers' type. Decorative scenes can be "painted" by cleverly arranging the ornamental type units found in any printing shop. Type pictures call for endless patience and time. A pencil sketch serves as a guide for the typographical layout.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

cluf.
This picture was made by cleverly arranging decorative printers' type

*Albert Schiller, artist.
at Eschylum - Society of Independent Artists
Esraua Central Palace, New York*

Three-Dimension Magnifier Fitted to Wearer



Examining patient with aid of adjustable three-dimension magnifier.

Designed so that it may be fitted to the individual, a new binocular loupe is equipped with three-power magnifying lenses providing stereoscopic vision. The lenses are mounted on the end of a bar extending from the specially designed frame and bridge. A flip of the finger throws the magnifier upward, out of line of vision, when desired. The loupe is essentially a spectacle frame with an ingenious aluminum block in place of a bridge. Round eyewires are mounted on slotted bars and held to the bridge block by set screw. By loosening the screw each eyewire may be adjusted separately to get the proper interpupillary distance for the wearer. The loupe is useful in surgery, dentistry, ophthalmology and other branches of medicine. Laboratory workers, artists, etchers, engravers, locksmiths, clock and watch makers and jewelers also will find it an aid to vision in their work.

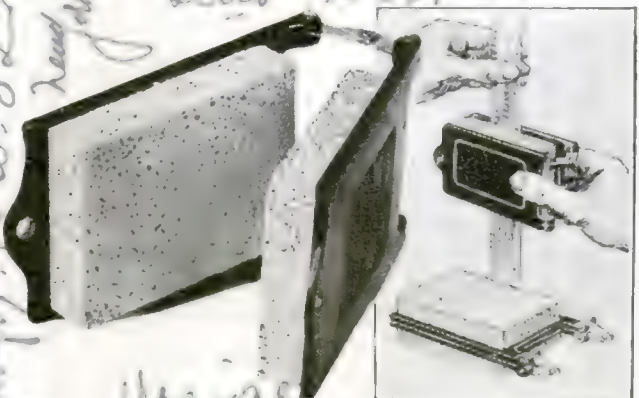
Chemical Cools Plane Engine Approved by Army

Rated at 1,000 horsepower, the Allison aircraft engine, recently approved by the

U. S. Army, is cooled by chemical. Ethylene glycol is used instead of water. It has a boiling point of 387 degrees Fahrenheit, thus permitting more effective cooling radiators to handle heat transfer from cylinders to atmosphere than water, which boils at 212 degrees. Water-cooled motors require large radiator area. The frontal area of the Allison engine is only six and one-fourth square feet, compared to sixteen and three-fourths for air-cooled engines of less power. The Allison is fitted with a turbo supercharger driven by waste exhaust gases. It delivers to the carburetor at sea-level pressure the rarefied atmosphere at high altitudes to provide air necessary for proper combustion. Thus the engine develops its full 1,000 horsepower up to an altitude of 25,000 feet, permitting very rapid climbing and high speeds. Weighing 1,275 pounds, the engine again gives America the lead for the most powerful lightest weight power plant for aircraft, answering the complaint of many aviation technicians that England, and other European nations, had superior aircraft motors, particularly for military purposes.

Twin Sponges Dry Photo Film on Both Sides at Once

Two sponges mounted with triple hinges offer photographers a quick method of drying negatives or paper. With the sponges pressed together, film can be



Reversible sponge-pack used to blot photo paper and to dry negatives by drawing between sponges

drawn between them to be dried on both sides in one operation. The sponge-pack can also be opened flat for double-width drying, or folded back to back.

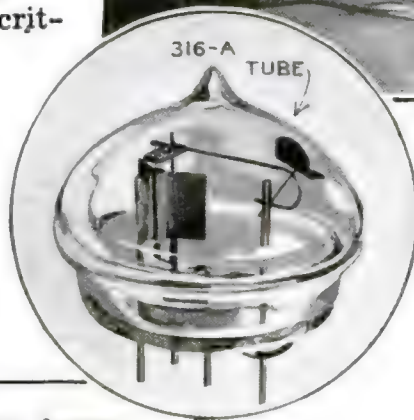
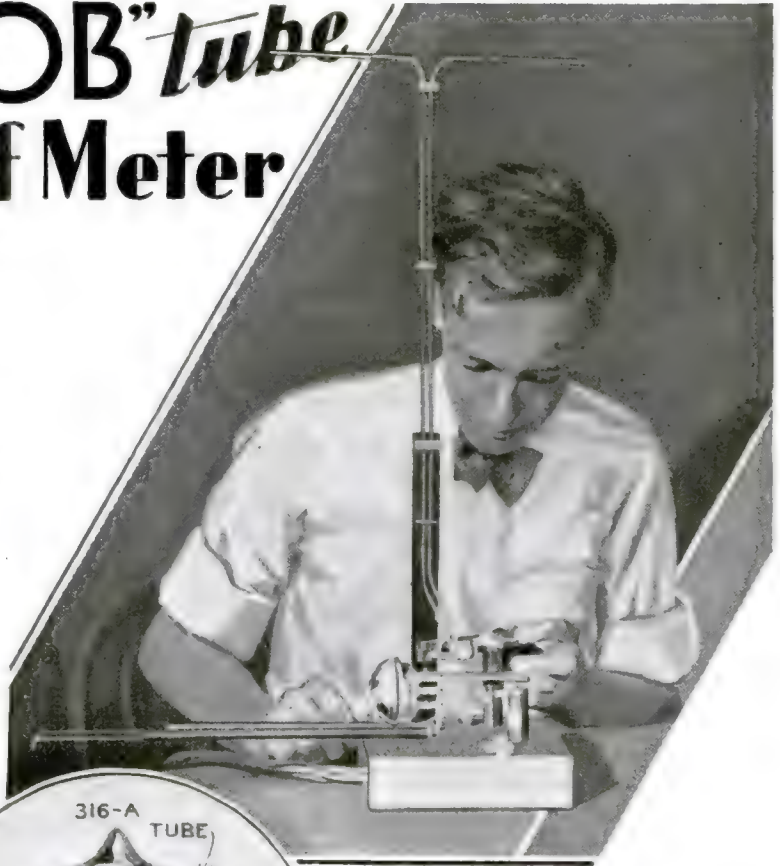


“DOORKNOB”[™] Tube for One-Half Meter Operation

NEW limits in the development of radio communication at ultrahigh-frequencies have been reached by means of specially designed tubes recently introduced by the Western Electric company.

Heretofore, the only sources of real power available to experimenters for high frequencies corresponding to wave lengths of less than a meter, were tubes of the electron-oscillation or magnetron types. These tubes required critical adjustment that was difficult to maintain. To avoid this difficulty, the so-called “doorknob” 316-A tube of ordinary negative-grid type has been developed.

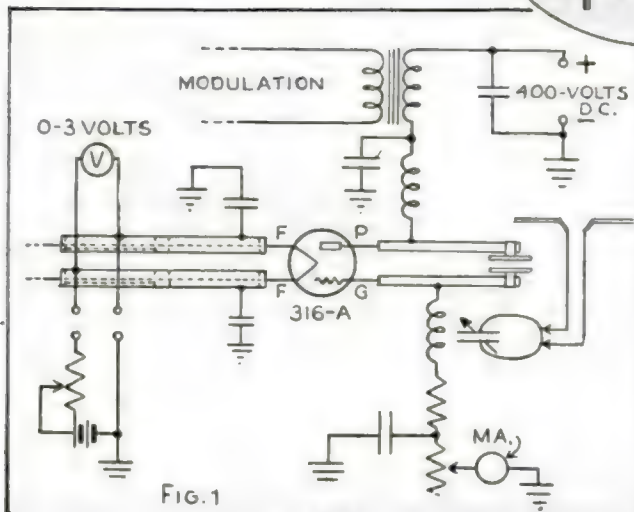
The conventional base has been eliminated com-



pletely, each lead being brought out through a molded glass end plate which is part of the tube envelope. Circuit connections are made by means of brass sleeves that slip over the rods where they are held firmly by set

screws; soldering is not recommended because of the high operating temperatures. The filament supply is 2 volts, either a.c. or d.c., with a current requirement of 3.65 amperes.

An experimental half-wave transmitter is shown in the upper photo and the schematic circuit diagram appears in Fig. 1. It is said that 6 watts can be radiated from this transmitter. Suitable receivers may be made with tubes already available to radio experimenters.



*Western Electric Co.
195 Broadway New York*

Self-Powered

By
R. C. Hitchcock

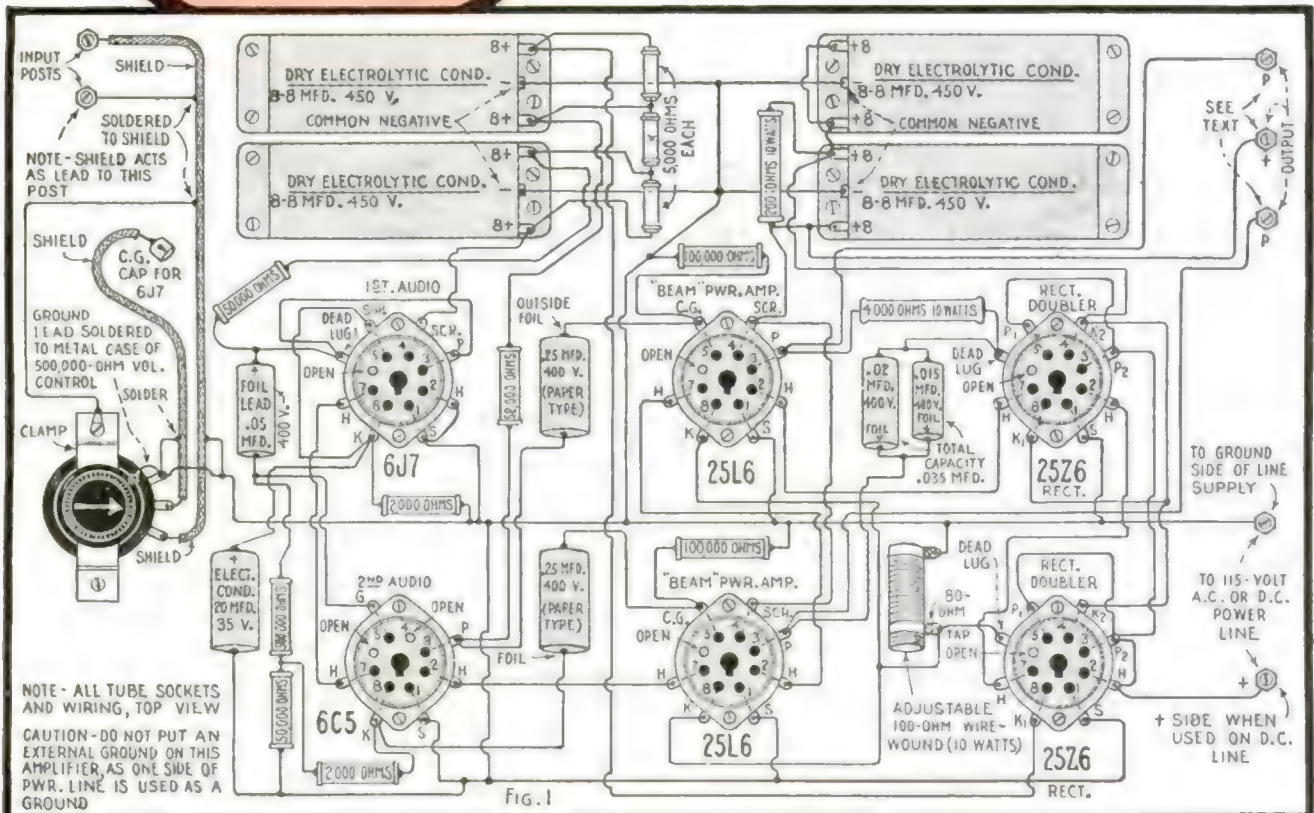
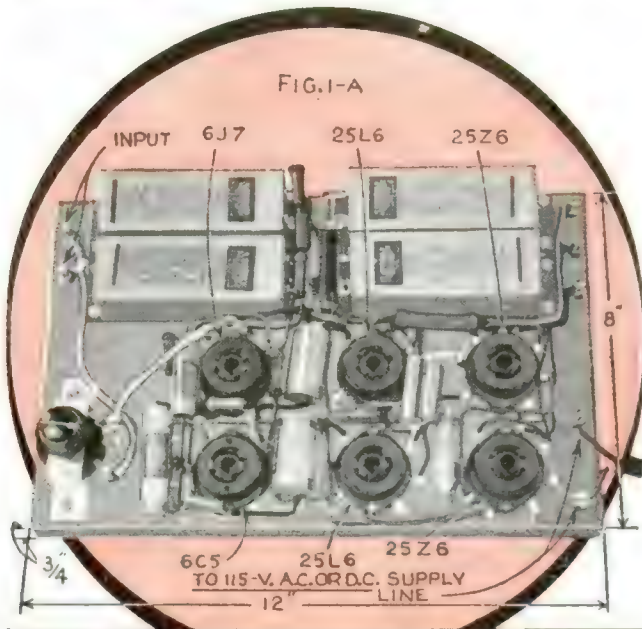


ANYONE can build this 6-tube a.c.-d.c. audio amplifier and use it to bring an old phonograph up to date. The only additional parts necessary

will be a magnetic pickup arm for your phonograph and a suitable permanent-magnet type dynamic speaker.

The unit consists of a 3-stage amplifier employing two new beam-power tubes that have real power-delivering ability. The undistorted high-quality audio output is $3\frac{1}{2}$ watts at a very low hum level.

Complete with built-in power supply, all parts are assembled on an 8 by 12-in. wood baseboard; the maximum height is $4\frac{1}{2}$ in. It can be operated on any 115-volt, 50 or 60-cycle a.c. line or on a 115-volt d.c. line if desired. This choice of operating current is unusual in an audio amplifier. There are no interstage transformers, power transformers or chokes in the unit.



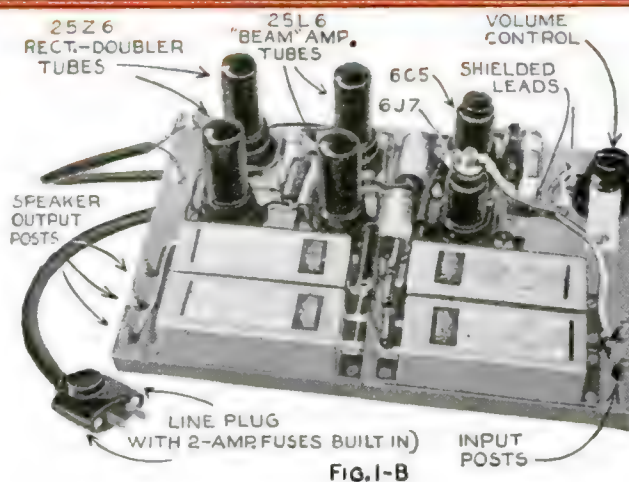
AUDIO AMPLIFIER

*requires no
transformers
or chokes*

The speaker, of course, comes with an output transformer on it, and this should have a center-tapped push-pull tube winding of from 2,500 to 3,000 ohms, capable of carrying 50 ma. of direct current each side of the center tap. Speakers of this type are available from all-parts houses at reasonable prices.

To install the amplifier in a phonograph console, it is only necessary to remove two of the record shelves as illustrated in the sketch. In some cases the speaker can be mounted on a small baffle board and installed in the horn opening. If this is not practical, remove the phonograph sound chamber and mount the speaker baffle on a shelf by means of angle brackets. A 2-conductor shielded cable should be used to connect the pickup arm to the input posts on the amplifier unit, the cable shield being connected to the common ground input terminal. It is important that no external ground of any description be used, since with a transformerless circuit the line voltage is one terminal.

A simplified wiring diagram of the complete amplifier unit is given in Fig. 1 and the schematic circuit diagram appears in Fig. 2. It will be noted that there are socket terminals for each tube which do not connect with any of the elements of the tubes. Such blank terminals make convenient places to solder wires which otherwise would be unsupported. Shielded leads must be used both for the volume control and the cap lead to the 6J7



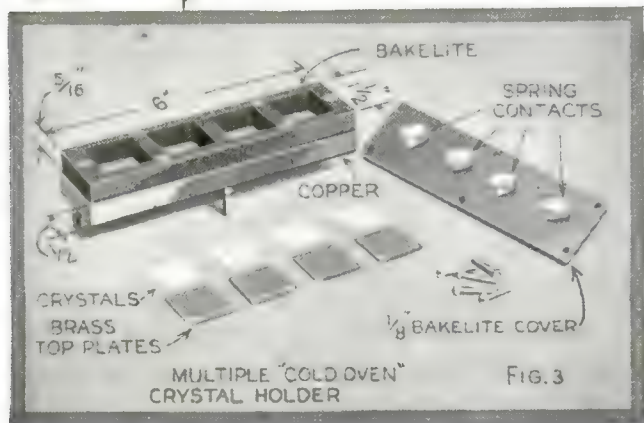
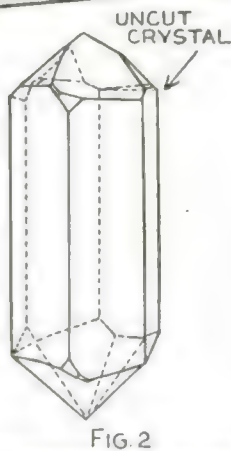
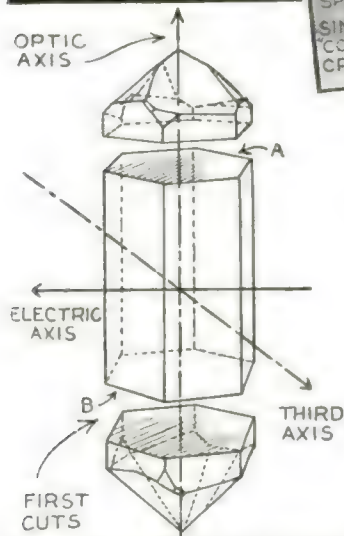
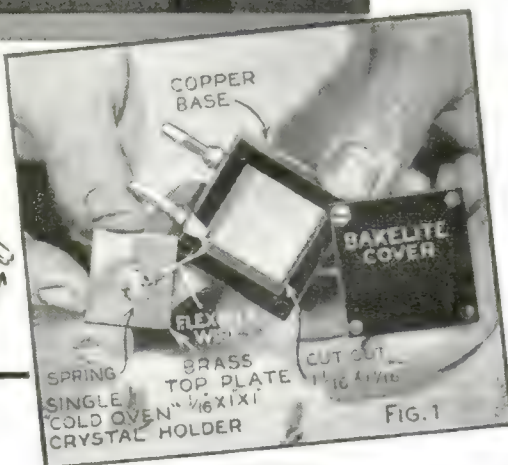
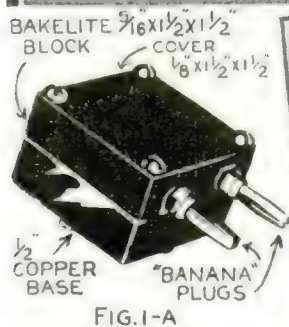
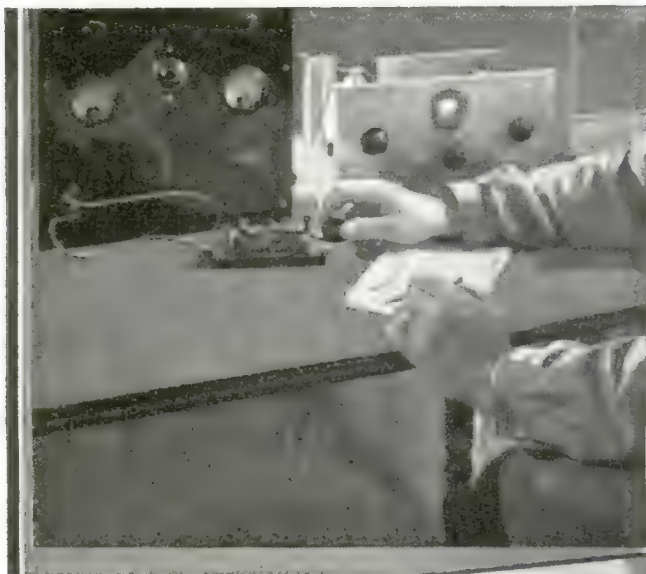
tube. In addition, the metal case and shaft of the volume-control potentiometer must be connected to the wire shields, and all connected to the common wire which runs to the ground side of the line supply. All tube heaters are in series.

Please note that one of the fixed resistors is 52,000 ohms; this unusual value is found by testing the three 50,000-ohm resistors specified in the material list. An ohmmeter will usually show one of these

(Continued to page 142A)

Homemade 'Cold Oven' Piezo Crystal Holders

By Calvin F. Hadlock



IN THE amateur transmitter of today, piezo crystal control is, without question, the best way to insure a perfect carrier that will not wander out of the band limits specified for amateur radio operation. Accurately ground quartz crystals are not expensive. However, most experimenters like to operate on several different bands and even at different points on the same band; in this case the problem of providing a suitable holder for each crystal often places a severe strain on the pocketbook.

The homemade crystal holders shown in photos Figs. 1 and 3, are not difficult to make and they include features not found in holders available to amateurs. As crystals operate on the calibrated frequency at normal specified temperatures, temperature-control ovens are employed in some climates to keep the crystals at the proper working point. Ordinarily this is not necessary in the amateur bands; however, when

operating on the 20 and 10-meter high-frequency bands a different condition is encountered which calls for some means of stabilizing the crystal frequency.

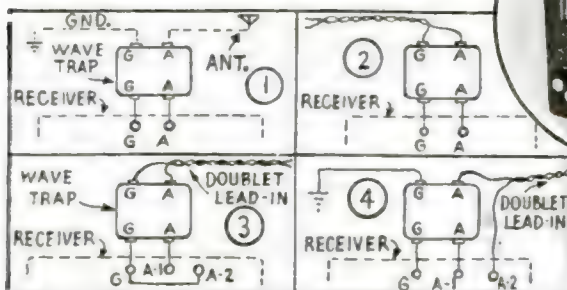
During a transmission of normal length on 20 meters, using a crystal in an ordinary holder, the carrier frequency will sometimes drift as much as 10 kilocycles; at 10 meters this drift is, of course, about 20 kilocycles. These holders are known as "cold ovens" because they stabilize the frequency and eliminate this drift without the use of a heater. The bases of the holders are solid blocks of copper 1/2 in. thick. Copper being an excellent conductor of heat, this large slab "soaks it up" as fast as it is generated, thereby maintaining the crystal at practically a constant temperature.

Details for a single-crystal holder appear in Figs. 1 and 1-A; the multiple-type, Fig. 3, enables the operator to change quickly from one crystal to another. The single unit closely follows ordinary construction, with the exception of the copper

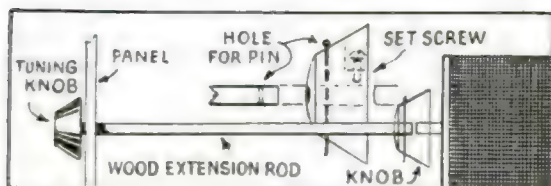
(Continued to page 146A)

Practical RADIO SUGGESTIONS

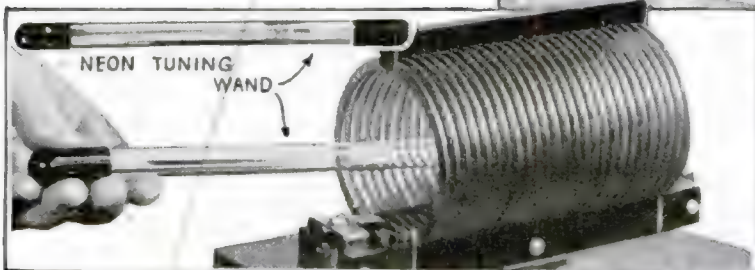
Any radio set owner can use this dual universal wave trap to suppress code and noise interference entering the receiver at intermediate frequencies between 400 and 475 KC.; at the same time, owing to dual control, it may be adjusted to eliminate interference from powerful near-by broadcasting stations. It is connected between the antenna and ground or doublet feeders, and the posts on your receiver, as shown below in Figs. 1, 2, 3 and 4



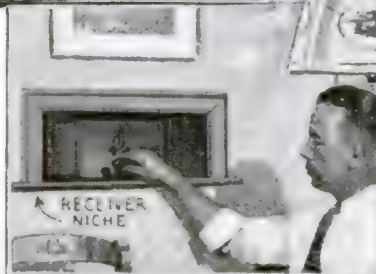
Right, sensitive circuit breaker protects costly tubes and condensers from accidental overloads. Below, extension shaft for tuning a short-wave receiver when body-capacity effects are troublesome



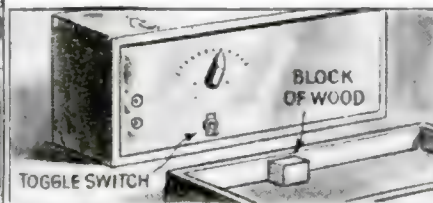
Below, neon tuning wand indicates current in r.f. circuits without any connection to the circuit; it provides an easy inexpensive method for adjusting any transmitter or receiver



Right, receiver and large separate speaker installation suggested where space is at a premium. This compact set is placed in a wall niche at a suitable height for easy tuning; note speaker mounted in ceiling on a small baffleboard which was backed with rock wool



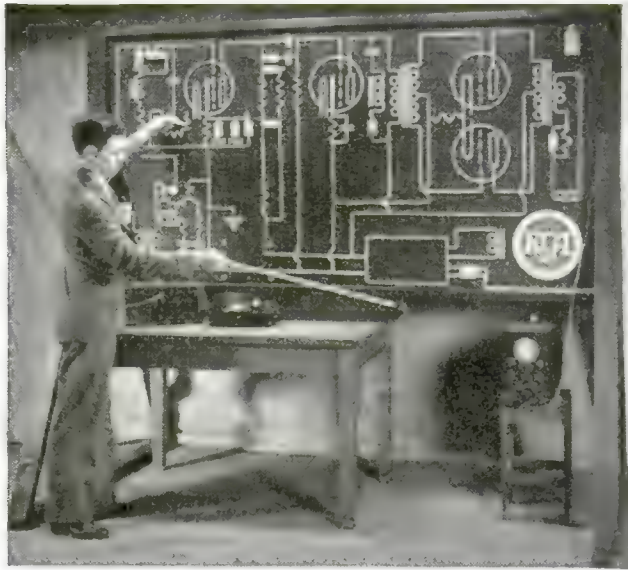
Below, a simple method of safeguarding batteries in portable test equipment, transceivers or battery-operated receivers. A small block of wood is screwed to the cover of the portable case at a point that will prevent closing of cover until the toggle-type battery switch is in the "up" or "off" position. This little block of wood will prevent many cases of "run-down" batteries when such equipment is needed



Toggle switch shown in the "down" or "on" position

*Littlefuse Laboratories,
4509 Ravenswood Ave
Chicago*

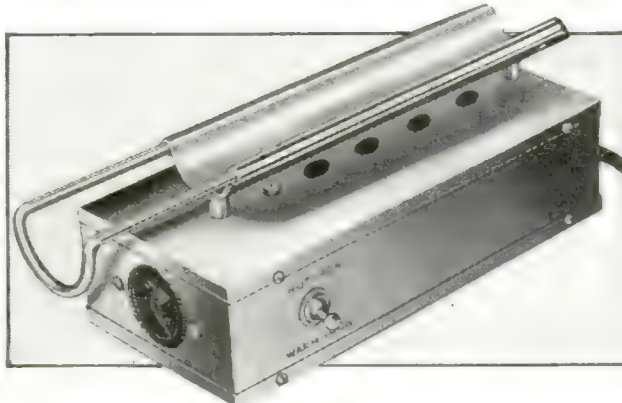
Radio Circuit Seen and Heard



Demonstrating to students and servicemen, visually and audibly, the effect of different circuit conditions upon the output of an audio amplifier, this apparatus traces a continuous response curve on the screen of the cathode-ray oscilloscope shown below the loudspeaker which is mounted on the board at lower right. Knife switches and controls inserted in this schematic diagram make and break similar connections in the actual amplifier located on the rear of the board.

Heat Control for Soldering Iron

Now you can regulate the heat of your electric soldering iron to meet individual requirements. This heat-control unit pro-



vides a rest, keeps the tip properly tinned and the iron at the right temperature. In the "down" position, the toggle switch enables the operator to maintain a warm iron at low cost; with switch "up" it is quickly heated and ready for use in a few moments. Claimed to double the life of an electric soldering iron, it is designed for use with any standard iron not exceeding 150 watts input, operating on 115 volts either a.c. or d.c.

Improved Punch for Socket Holes

No drilling of center holes is required to use this self-centering punch for making large holes in metal chassis bases to mount tube sockets and electrolytic filter condensers. The tool makes a clean round hole, as the cutting edges center them-



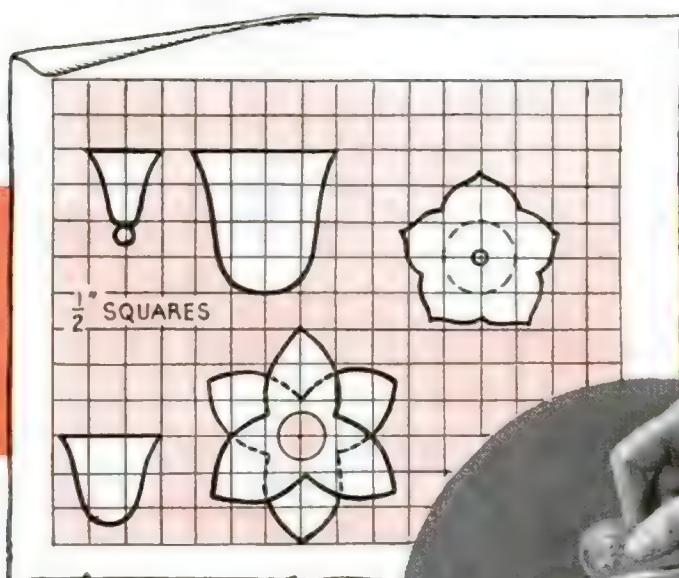
selves automatically when the head is struck with a hammer. It solves a troublesome problem for radio experimenters.

Blueprints covering radio construction articles in past issues are available for 25 cents each; original material lists and additional information can be obtained from our Radio Department without charge upon receipt of postage.

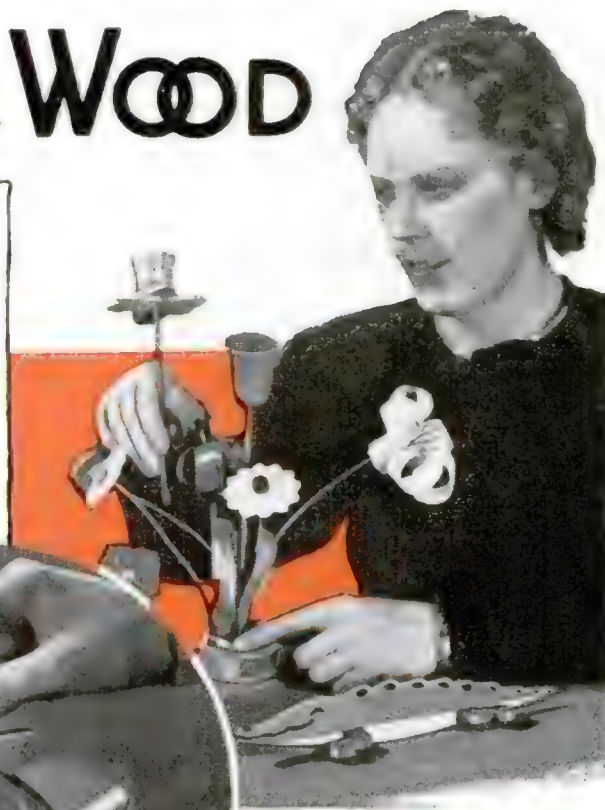
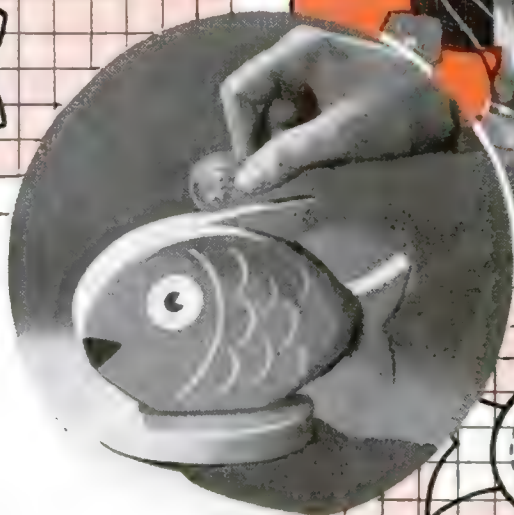
NEXT MONTH—How to Build a Low-Cost Call System. A small quick-heating a.c. unit with an output of $2\frac{1}{2}$ watts; suitable for operating one or more magnetic speakers at remote locations. Handy between house and garage or for general paging purposes. Also, construction details for a **High-Fidelity Speaker Cabinet**



NOVELTIES *in* WOOD

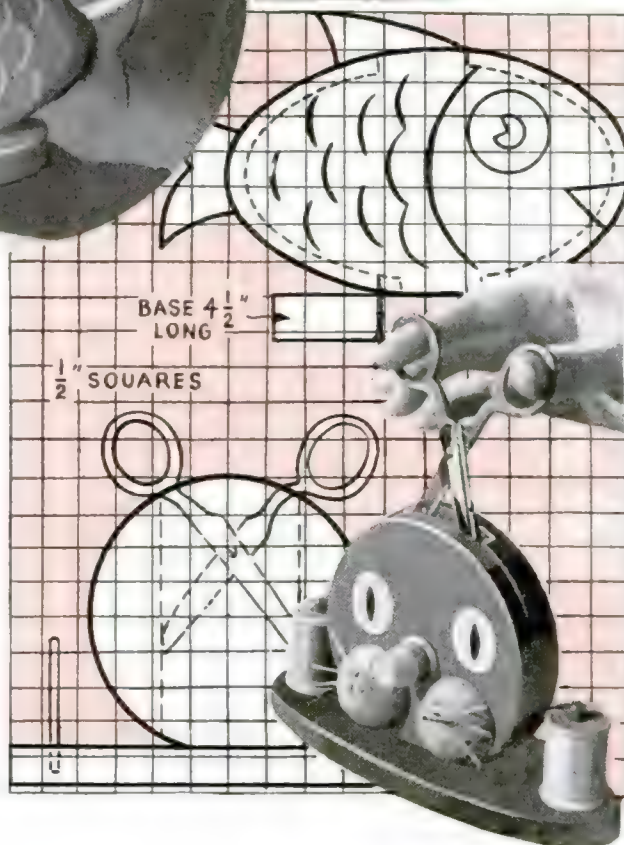


Each one has some useful purpose, is fun to make and profitable to sell



MADE from inexpensive woods and enameled or stained in bright colors, these novelties should prove profitable sales items. To form the flowers shown above, cup-shaped parts are turned in the wood lathe, and petals, imitative of many varieties, are sawed out of thin stock. Curved petals can be shaped from damp wood shavings stained to match the natural colors. Brads, nails, or tacks make realistic stamens, while stems can be made of dowel or stiff wire.

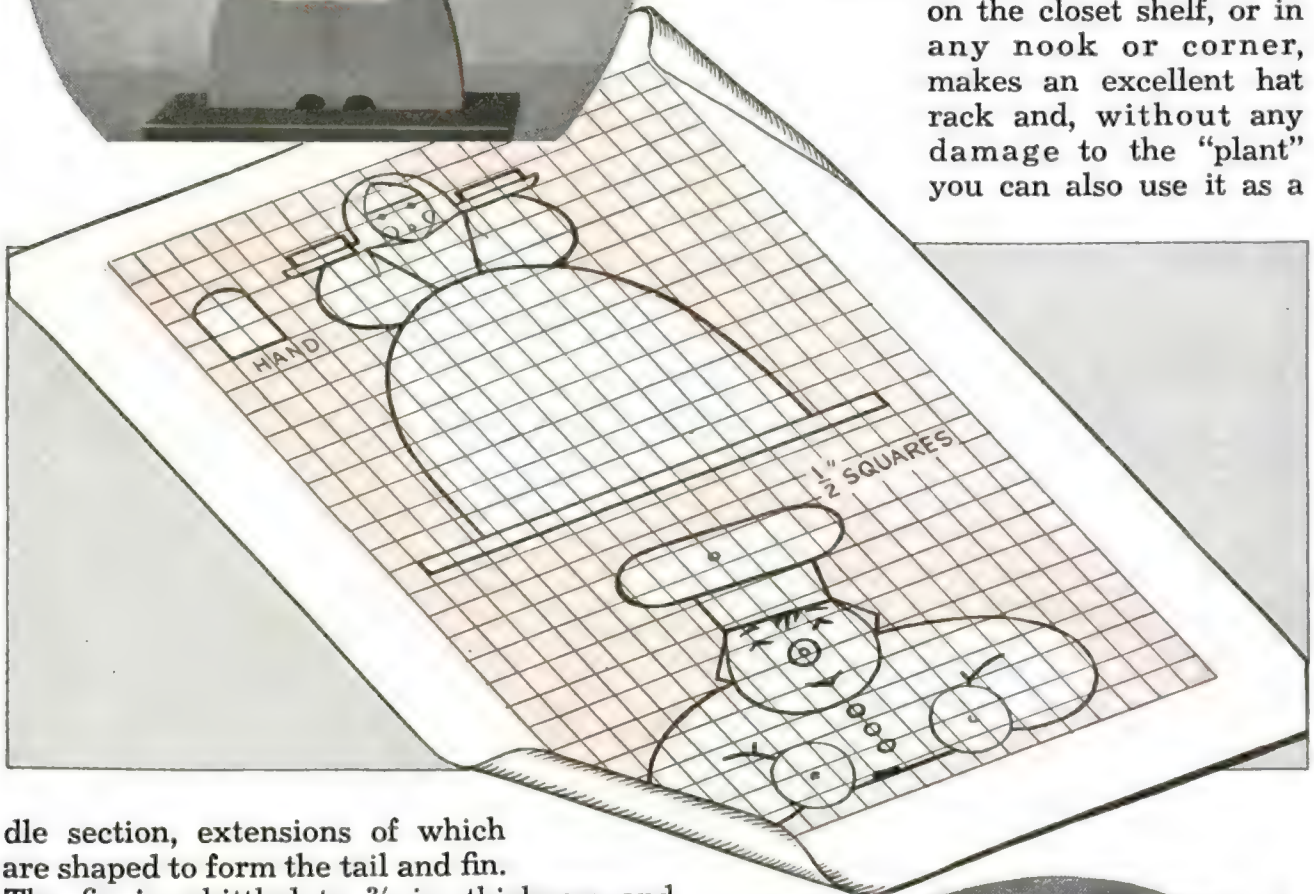
There's plenty of room between the scaly sides of the goldfish to hold nickels and dimes. Softwood, $\frac{1}{4}$ in. thick, is used for the sides, and $\frac{5}{8}$ -in. stock for the mid-





on $\frac{3}{8}$ and $\frac{1}{2}$ -in. stock, that is, all except the hands of the peasant girl which hold the candles. These are turned with an offset and recessed at the center to hold the lower ends of the candles firmly. The chef's "hands" are small hooks by means of which he patiently holds mixing spoons, ladles, saucepans and the like. His nose is a round bead. A small screw eye turned into the top of his cap provides a means of hanging him onto the wall. His white coat is kept buttoned with thumbtacks.

A rare species of cactus which thrives on the closet shelf, or in any nook or corner, makes an excellent hat rack and, without any damage to the "plant" you can also use it as a

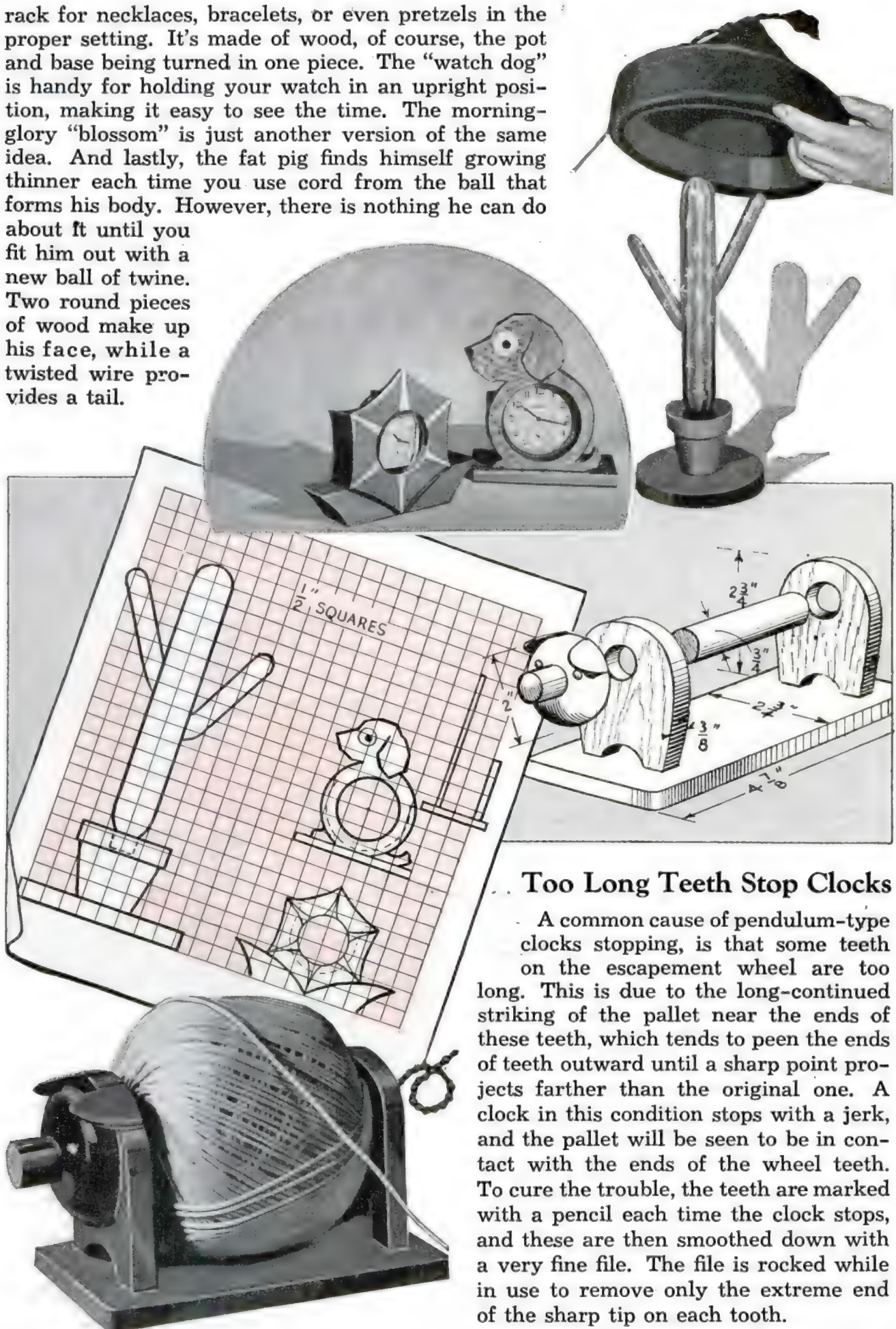


dle section, extensions of which are shaped to form the tail and fin. The fin is whittled to $\frac{3}{8}$ -in. thickness and slots 1 in. long are cut on each side for inserting the coins. The base is sawed and sanded from $\frac{5}{8}$ -in. stock and the fish is fastened to it with two screws driven up from the underside. Only by removing the two screws can you reclaim the coins. The sewing kit is the same type of construction, except that $\frac{3}{8}$ -in. stock is used for both the head and base. A $\frac{5}{8}$ -in. dowel tapered and glued to the face where the nose ought to be, holds the thimble and the halves of a round cork fishing float glued to the face on each side of the nose provide pincushions, the pins representing the whiskers. A $\frac{1}{4}$ -in. dowel in each end of the base holds spools of thread.

The peasant girl holding the candles and the jovial chef are just simple scroll-saw jobs



rack for necklaces, bracelets, or even pretzels in the proper setting. It's made of wood, of course, the pot and base being turned in one piece. The "watch dog" is handy for holding your watch in an upright position, making it easy to see the time. The morning-glory "blossom" is just another version of the same idea. And lastly, the fat pig finds himself growing thinner each time you use cord from the ball that forms his body. However, there is nothing he can do about it until you fit him out with a new ball of twine. Two round pieces of wood make up his face, while a twisted wire provides a tail.



Too Long Teeth Stop Clocks

A common cause of pendulum-type clocks stopping, is that some teeth on the escapement wheel are too long. This is due to the long-continued striking of the pallet near the ends of these teeth, which tends to peen the ends of teeth outward until a sharp point projects farther than the original one. A clock in this condition stops with a jerk, and the pallet will be seen to be in contact with the ends of the wheel teeth. To cure the trouble, the teeth are marked with a pencil each time the clock stops, and these are then smoothed down with a very fine file. The file is rocked while in use to remove only the extreme end of the sharp tip on each tooth.

—E. T. Gunderson, Humboldt, Ia.

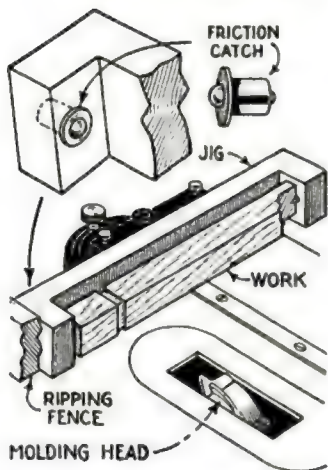
Pivoted "Spikes" Hold Toolbox Level on Sloping Roof



This toolbox rests level on a roof when the pointed legs are swung down

By pivoting a pair of spikes, made from small iron rod, to the side of the toolbox, it can be set on sloping surfaces. The spikes, when not in use, rest out of the way on a screw hook driven into the side of the box. When swung into position to support the box horizontally on a sloping surface, they snap into notched metal clips which are screwed onto the underside of the box at each end.

Jig Fitted with Friction Catch Speeds Production Work



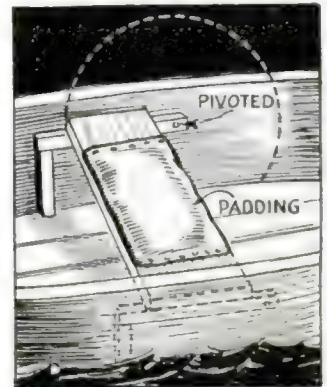
When finishing duplicate pieces of work on a circular-saw molding cutter, this jig, screwed to the miter gauge, will enable you to remove or insert the work rapidly. The jig is made of wood as shown, and is fitted with a pointed screw at one end

and a friction catch at the other, which serve as centers to support the work. The spring-contained catch bears against the

end of the work with sufficient pressure to hold it firmly. Aside from saving time, the jig is positive, resulting in accurate duplication of identical pieces.

Hinged Boat Seat Is Turned Over to Protect Cushion

Although a little upholstery would make the rowing seat of most boats much more comfortable, padding of any kind is discouraged on account of the weather, as the rain and sun would soon make it anything but pleasant to use. However,



it is practical to use a padded seat if it can be turned over when not in use. The seat is merely mounted on stringers, or wood strips, which are hinged to the side of the boat at the forward ends and supported by blocks at the other.

Five-Point Star Drawn Accurately with a Compass

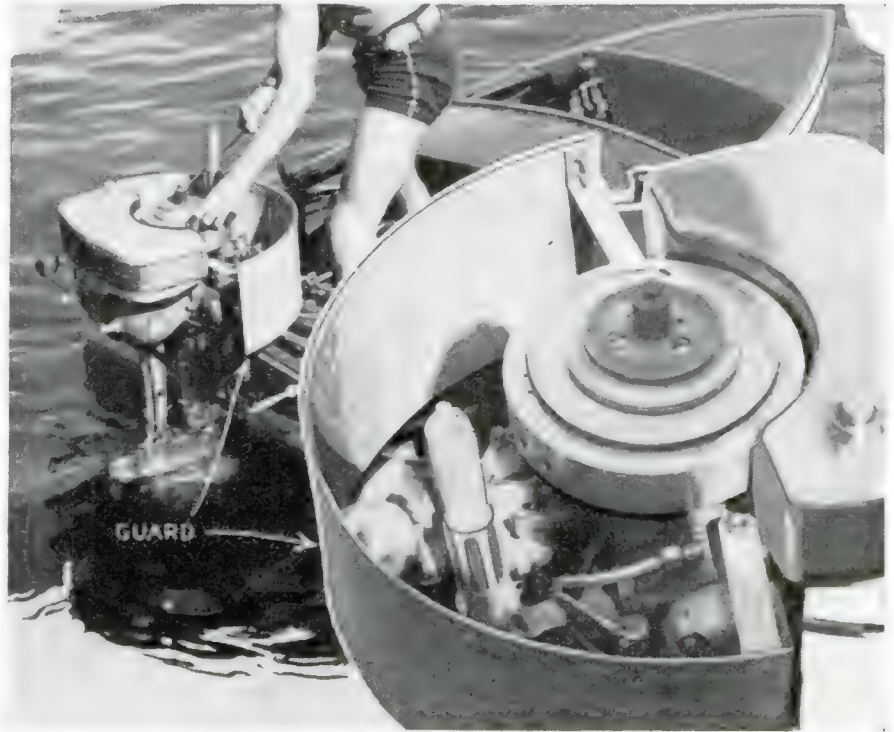


You can draw a perfect five-point star of almost any size desired by using this method

The next time you want to make a five-point star, try the following easy method: Draw a vertical line on the paper and, be-

ginning at the top, make five dots on the line, spacing them a distance equal to about $\frac{1}{8}$ of the dimensions of the star desired. Then draw a horizontal line at right angles to the vertical one, crossing it at the intersection of the third dot from the top. Now, using the next dot below as a center for a compass, make a circle having a radius to intersect the dot at the top of the line. Next draw the straight lines from the intersections of the horizontal line and edge of the circle across the lower dot to the lower edge of the circle. The star is completed by drawing two lines from these points to the upper dot.

Sheet-Metal Guard on Outboard Motor Shields Against Splashing Water



This splash shield is bent around the front of an outboard motor and is fastened to the cylinder-head bolts

Paper Bags "Tied" without String by Folding Top

Three folds will close the mouth of a paper bag and provide a good grip without using any string. The first fold is made at a 45° angle at one corner, after which the other two are made by bending down the corner of the bag and turning it under the first fold.



By making the three simple folds shown above, the mouth of a paper bag can be closed tightly

If you have ever been bothered by water splashing up and "drowning" your outboard motor, here is a guard that will help stop the trouble. Made from a strip of galvanized sheet iron 10 in. wide, the guard is bent to a half circle and is fastened to the motor by means of short pieces of flat iron riveted to the metal and slipped under nuts of the cylinder-head bolts. A third piece of flat iron in the center of the guard slips under a nut on the carburetor.

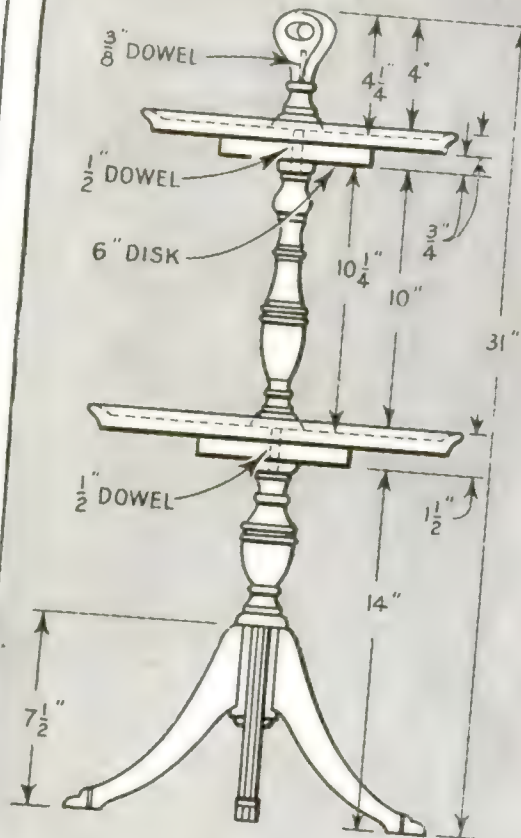
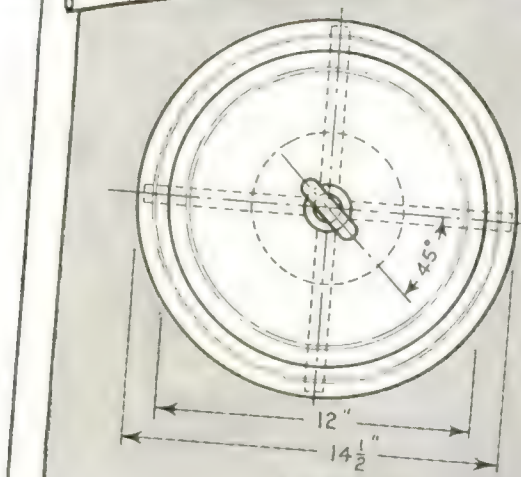
—John Thomson, Hollywood, Calif.

Watermelons "Plugged" Neatly with Altered Trowel

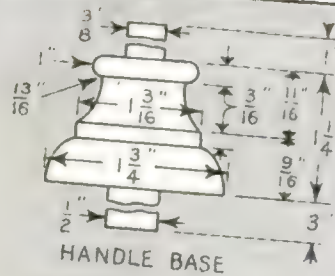
To "plug" watermelons quickly and neatly, just take a small hand trowel and bend the sides downward at right angles. Then grind the edges of the blade sharp, bringing them to a point at the end.



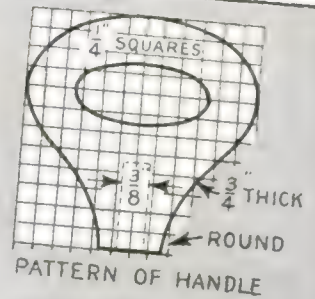
TWIN-TOP TABLE



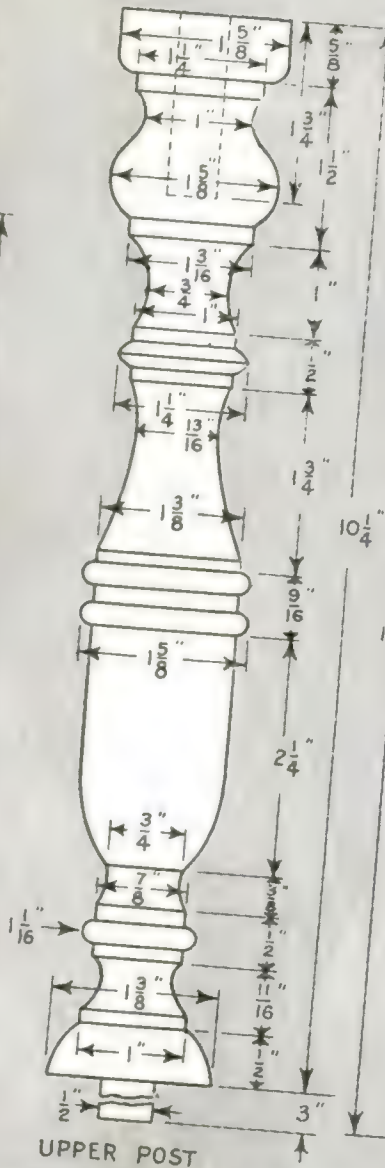
TOP & FRONT VIEW



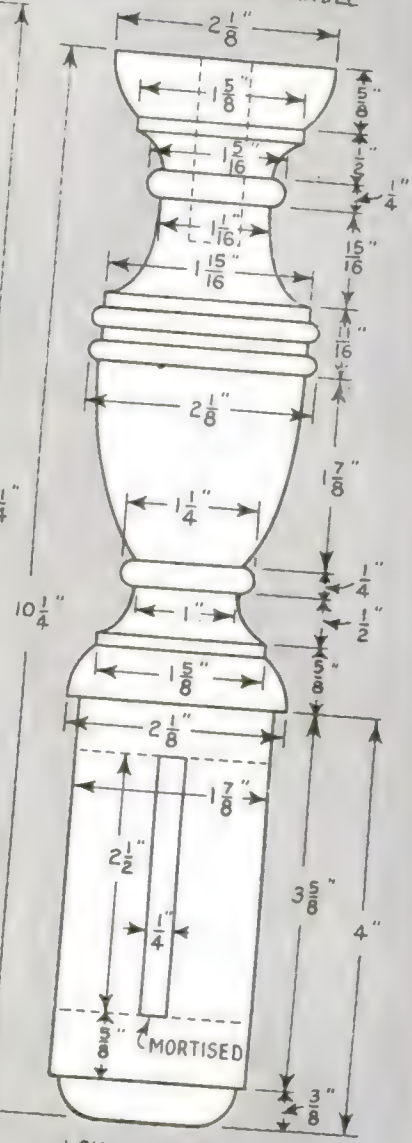
HANDLE BASE



PATTERN OF HANDLE



UPPER POST



LOWER POST

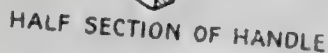
SCALE OF
DESIGNED BY
DRAWN BY

To display your choice pieces of china and bric-a-brac, or as a stand for smoking supplies in the den, this double-deck table is a job in woodturning—every part except the legs and the handle. Walnut, finished with two coats of shellac and then waxed, gives a pleasing effect

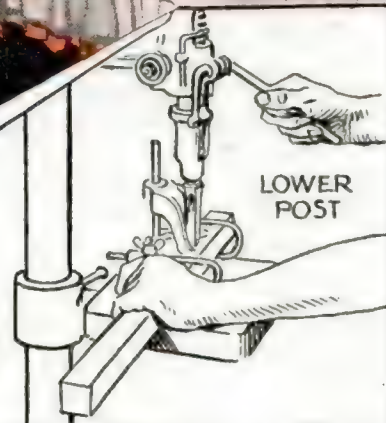
**POPULAR
MECHANICS
MAGAZINE**



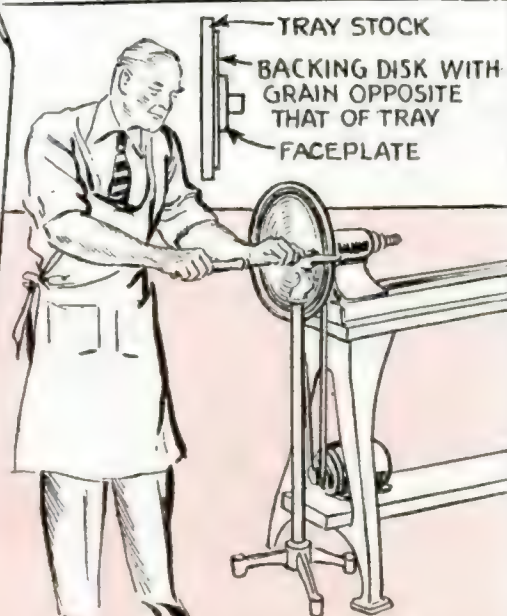
WALNUT,
LINSEED-OIL FINISH



THE FOOT
MORTISES
SHOULD BE
CUT BEFORE
TURNING
POST



LOWER
POST



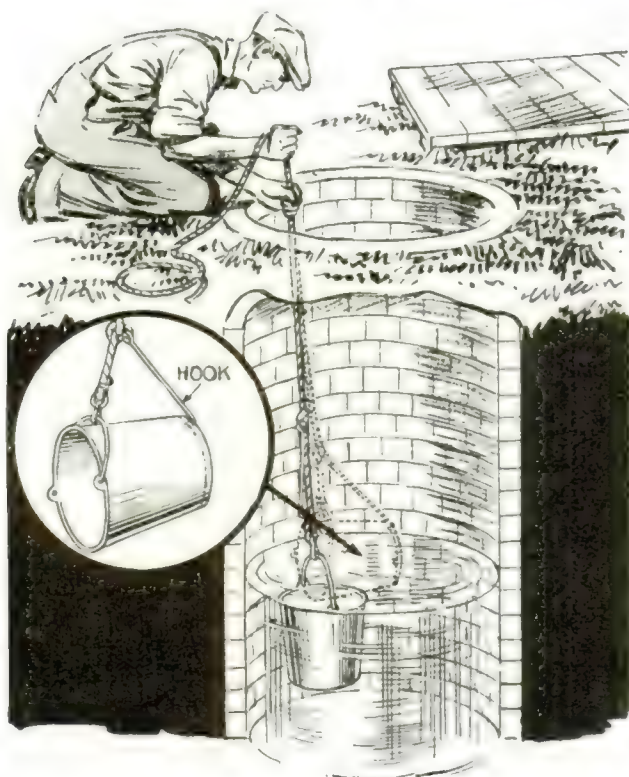
TRAYS ARE TURNED ON THE
OUTER END OF LATHE SPINDLE

ISSUE

POPULAR MECHANICS MAGAZINE
200 E. ONTARIO ST. CHICAGO

BLUEPRINT No. SN 964

Bucket Tipped by Hook on Rope When Bailing Cisterns



This hook holds bucket horizontal for quick filling, after which slackening the rope releases it

When water is to be bailed from a tank or cistern, it will not be necessary to jerk the bucket about to fill it if a long hook is knotted loosely in the rope at the point indicated in the detail. The hook will engage the bottom rim of the bucket when it is lowered to the surface of the water, holding it in position to be submerged quickly. A slackening of the rope from above releases the hook so that the bucket can be lifted.

Sink Stoppers Provide Covers for Chemist's Jars



Instead of employing large corks or screw caps to seal many of the jars in his laboratory, one experimenter uses rubber sink stoppers. These are of size suitable for jars of various

kinds and are heavy enough to seal ordinary dry chemicals, as well as some liq-

uids, against air or dust. Besides, they are easily removed so that little time is wasted in giving access to the contents.

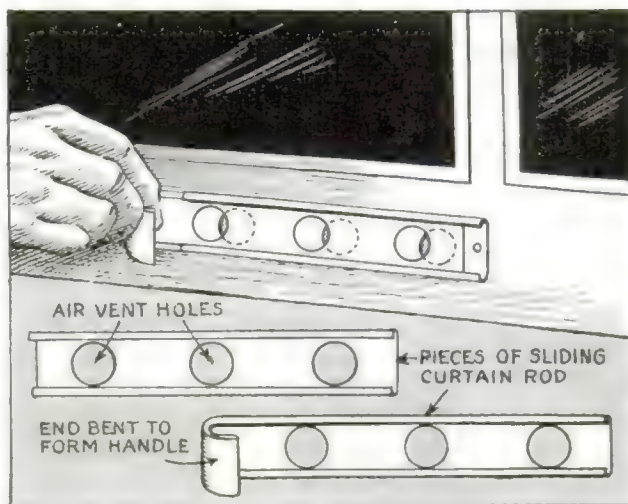
Coat Hanger Suspends Hip Boots for Drying Quickly

Although usually stored right side up and folded over, hip boots should be kept inverted at full length to prevent rotting and cracking of the rubber at the fold creases. This can be done easily by bending a wire coat hanger to the shape shown so that the cross bar will engage the boot heels. The hanger is suspended from a hook in a storeroom.



Ventilator for Shop Window Made from Curtain Rod

To allow fresh air to enter a shop or garage window in small and easily controlled amounts, why not install a three-hole sliding ventilator which is cut from two pieces of telescoping curtain rod? Punch these with corresponding holes and bend the narrower one to provide a finger grip by which it may be pushed back and forth. When the wider section is tacked over a slot cut in the window sash, the inside piece may be slid back and forth to open or close the vent as desired.



A short piece of flat, telescoping curtain rod is all you need to make this window ventilator

This PACK "SADDLE" *fits your back*

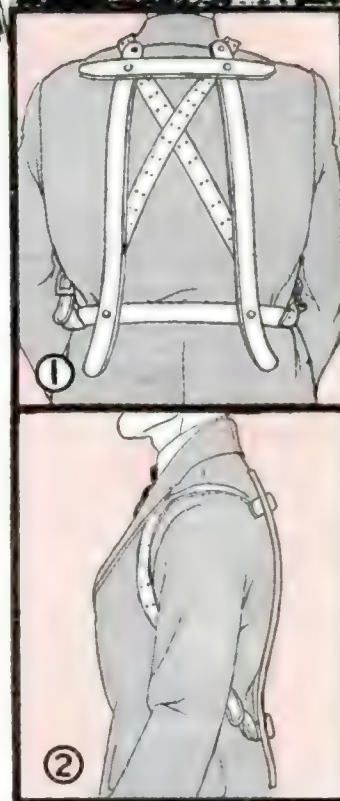


The pack sack is supported on a wood frame that you can easily "tailor" to suit your own individual build

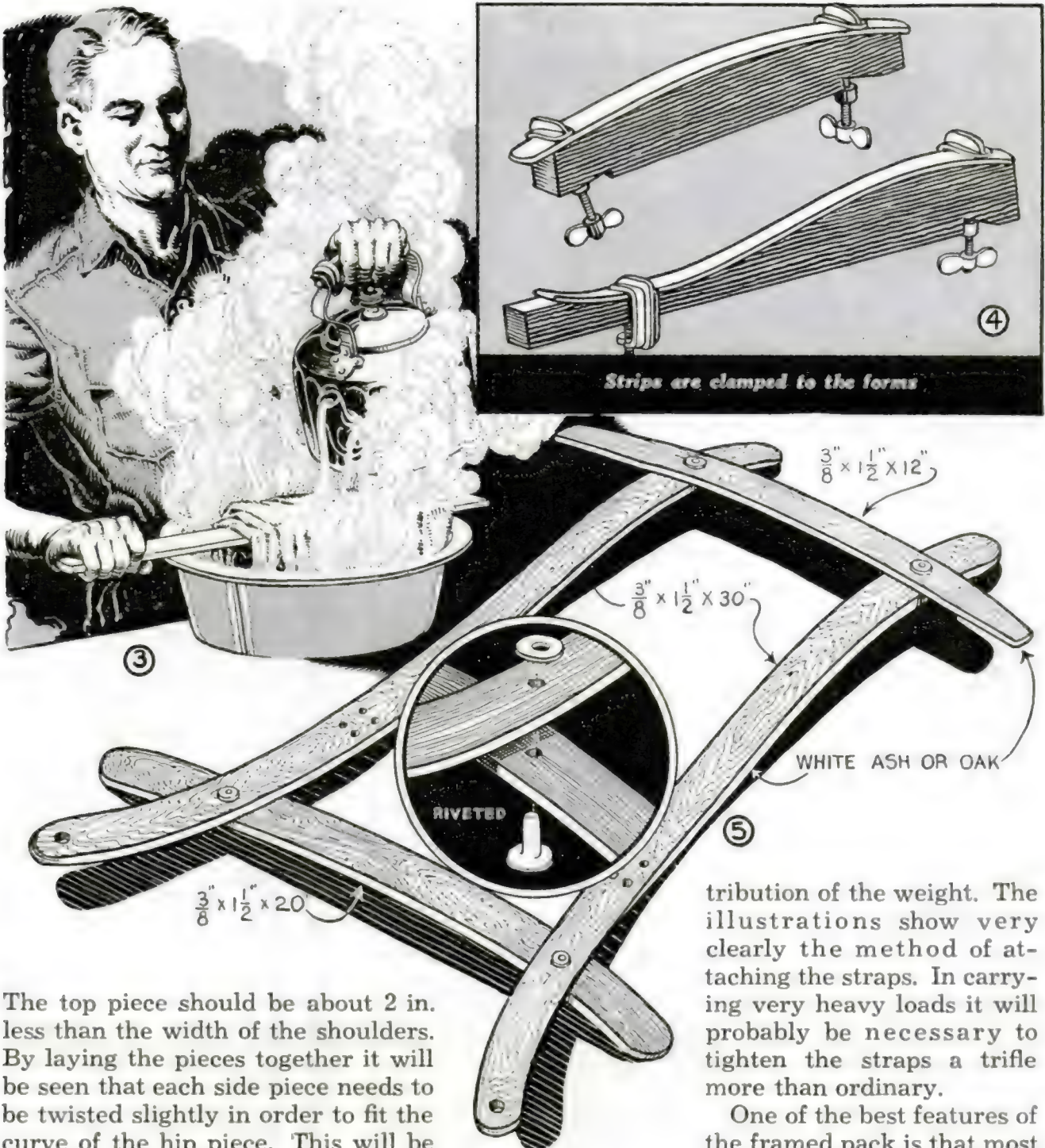
HERE'S a pack saddle that can be made to fit just like a glove, and it's designed to give an equal distribution of weight from the shoulders down. The back, from shoulders to hips, carries the load, as you'll see from Figs. 1 and 2, all of which means relief from binding and chafing at the shoulders. You can walk naturally—no "leaning into the harness" to carry a heavy load.

The frame, a four-piece affair, is made from white ash of the general dimensions given in Fig. 5. These can be varied, of course. If you cannot get selected white ash for the frame, white oak will do. The side pieces of the frame have an "S"-shaped curve combined with a slight twist. The exact shape of this curve depends on the individual build and cannot be given exactly. However, you can get a pattern of your own back easily by simply bending a piece of heavy wire to fit, allowing about 1 in. clearance over the shoulder blades and exaggerating the flare at the hips. Measure the distance from the top of the shoulder blades to the belt and cut the side pieces about 8 in. longer. Now, using the wire as a pattern, you make bending cauls for the side pieces and the cross piece at the hip, as in Fig. 4.

Bend the wood as in Fig. 3, wrapping it in a piece of cloth and then pouring water on it in a continuous stream. In a short time the wood will be flexible enough to bend readily.



Vertical members of the saddle are curved and joined to cross members in such a way as to distribute the weight of the sack uniformly from the shoulders down



The top piece should be about 2 in. less than the width of the shoulders. By laying the pieces together it will be seen that each side piece needs to be twisted slightly in order to fit the curve of the hip piece. This will be taken care of when the parts are riveted together. After bending, give all pieces a thorough sanding and apply a coat of shellac or linseed oil. Follow this with spar varnish, and rub smooth with fine steel wool. Now assemble the parts with copper rivets. The tops of the side pieces are separated about 4 or 5 in., the shoulder piece being fastened on about 2 in. below the top ends. The side pieces are then steamed lightly and riveted to the hip piece, which must be placed low enough to be tipped downward by the flare of the side pieces. The position is important as it is this piece that effects an equal dis-

tribution of the weight. The illustrations show very clearly the method of attaching the straps. In carrying very heavy loads it will probably be necessary to tighten the straps a trifle more than ordinary.

One of the best features of the framed pack is that most any kind of a sack can be lashed to it. The sack shown is one that has been found practical for average use. The bottom is about 6 by 16 in. but the sack is cut so that the top is 16 in. square. A drawstring threaded through grommets closes the top of the sack. The back is made of one piece and has a large pocket with flap, while the front, sides, and bottom are cut from one piece and sewed to the back. For fastening to the frame, loops of webbing are sewed to the sack and these are in turn lashed to the frame by thongs. All leather parts should be softened with neat's-foot oil.

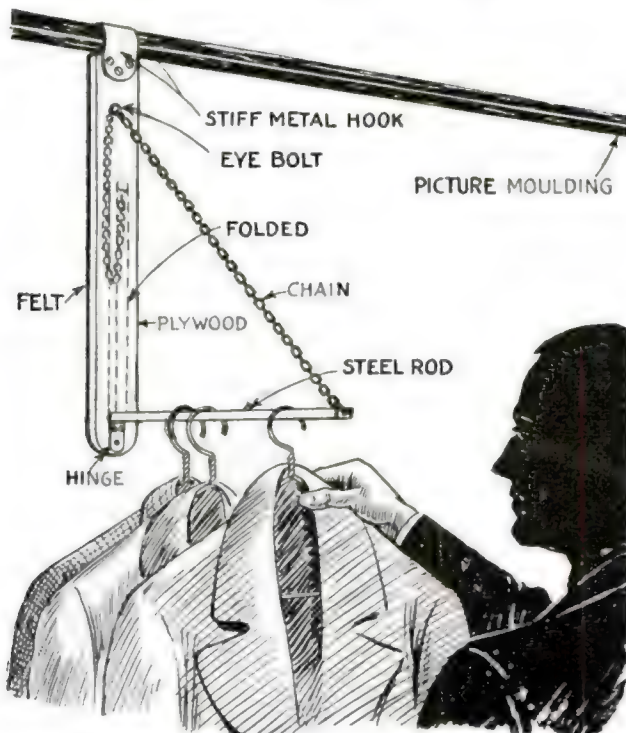
Bottle Stopper Locks with Key

Bottles of poison, acids, corrosive liquids, etc., can be locked safely with this stopper so that the contents will not be accidentally used by children or adults. Just take a combination rubber and metal stopper of the plunger type, which is often used in opened bottles of carbonated beverages, and slip a tiny butt hinge under the head of the plunger, first drilling holes in the hinge for the shackle of a small padlock.



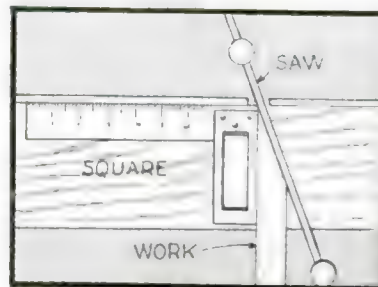
This Folding Coat Rack Hangs from Picture Molding

Folded flat into little space, a number of these coat racks may be kept on hand either in homes or offices to accommodate garments of social gatherings or business meetings. Salesmen and tourists who travel "heavy" will find it convenient to carry a couple in their trunks. The rack can be hung from any picture molding. For use on average walls, it should be from 2 ft. to 2½ ft. long, with an arm 1 ft. long.



A few of these racks kept on hand will accommodate many garments at large gatherings

Try Square Serves as Miter-Box Stop to Cut Sharp Angles



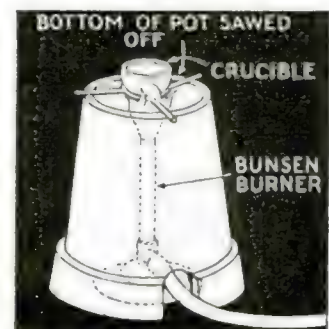
By using a try square to aline work at right angles to a miter box, cuts of almost any angle are made

When it is necessary to cut work in a miter box at a greater angle than 45°, the following method will be helpful. Place the work in the box at right angles to the bed and hold it in alinement with the aid of a try square as shown. With the work held in this way, the saw can be swung to cut almost any desired angle.

—Wayne C. Leckey, Aurora, Ill.

Flame Shield for Bunsen Burner Made from Flowerpot

I have found that a medium-size flowerpot provides a dandy flame shield for a bunsen burner in my chemical laboratory. Besides protecting the flame against drafts, the pot affords a rigid and convenient support for dishes, crucibles, triangles, etc. The bottom of the pot, which is turned upside down over the burner, is removed and a notch is cut in the rim of the top to straddle the burner hose.—Geo. Vias, Chicago.





Out with the

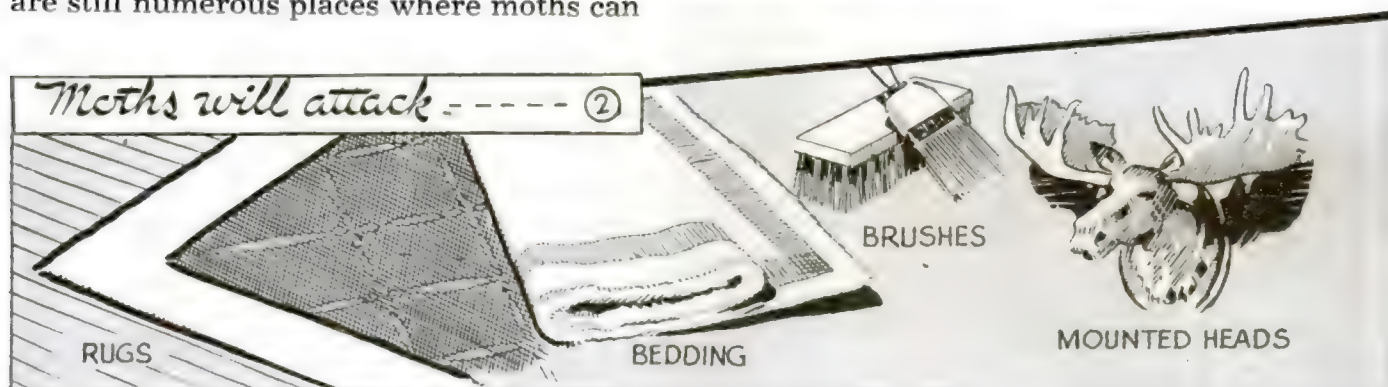
①

OVER two hundred million dollars of damage to clothing, bedding, carpets and furniture, is the annual moth toll. Of the three common kinds of moths generally seen, the most harmful one is the webbing clothes moth—a little buff-colored one having a wingspread of about $\frac{1}{2}$ inch. It is not attracted to light like the others but flits around in the darker parts of the room, just beyond the range of lamp illumination.

In houses kept scrupulously clean, there are still numerous places where moths can

conceal themselves and live for several months. They readily get in tiny floor cracks, under and behind baseboards and similar places where they can feed on lint and hair from pet animals. Later, while you're sleeping perhaps, they will find their way into clothes or upholstered furniture where considerable damage may be done before it is detected. An adult moth at the flying stage is practically harmless and rarely lives longer than a month. But the eggs—averaging about 100 per moth—are laid right in the folds of a fine woolen dress, suit or other material (See Fig. 2) and these hatch into tiny worms or larvae, which do the damage. Larvae feed upon wool, hair, fur, feathers and materials manufactured from them until they are large enough to form cocoons, from which more moths emerge. So every moth killed helps to reduce infestation.

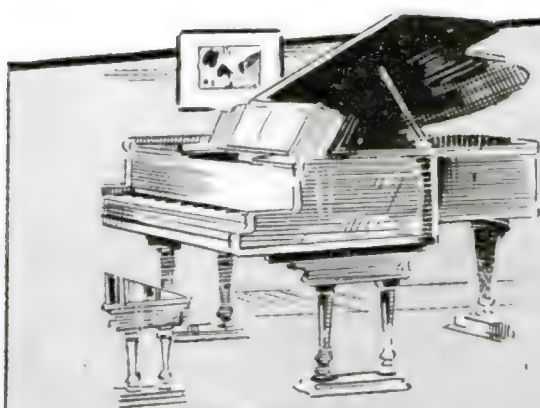
The best method of preventing the hatching of eggs is to brush thoroughly, air and sun at monthly intervals, all arti-



MOTHS!

cles that are subject to attack, as in Fig. 1. Fortunately the eggs are extremely fragile and that's why a thorough brushing and rubbing will generally destroy them. This is also the reason why clothing that is worn frequently is not infested. The brushing of articles should be thorough, especially at the seams and folds and places subject to perspiration. Dry-cleaning and washing garments and blankets thoroughly will remove all traces of moth eggs and larvae, except the tell-tale holes in case damage has been done.

For garments that are to be stored away for a season, something more than brushing is required to be reasonably safe. Should any of the tiny eggs remain undestroyed, damage may result. There are three common and inexpensive materials on the market, available to everybody and any one of these, under proper conditions, will destroy moths in any of the stages. They are naphthalene flakes or balls, (moth balls) paradichlorobenzene flakes and gum-camphor chips. Paradichlorobenzene has a more pleasing odor and is less persistent than naphthalene so that traces of it are soon gone. Its cost is a little more than that of naphthalene. The odor of none of these preparations is a deterrent to moths, as commonly believed, but the fumes which are slowly given off, will, in sufficient concentration, destroy them. A quantity of about 1 lb. of any of the materials referred to must be used for each 6 to 8 cu. ft. of space, which must be sealed to prevent the escape of the fumes. However, protection



PIANO FELT



CLOTHING



UPHOLSTERED FURNITURE



Storage compartment built in clothes closet

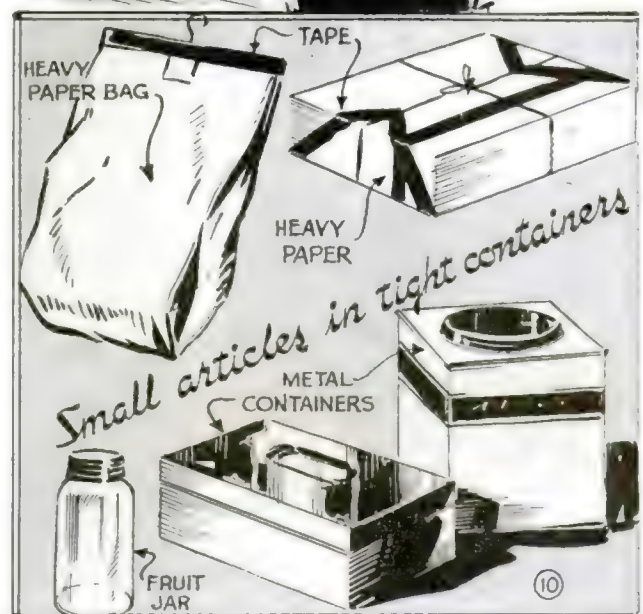
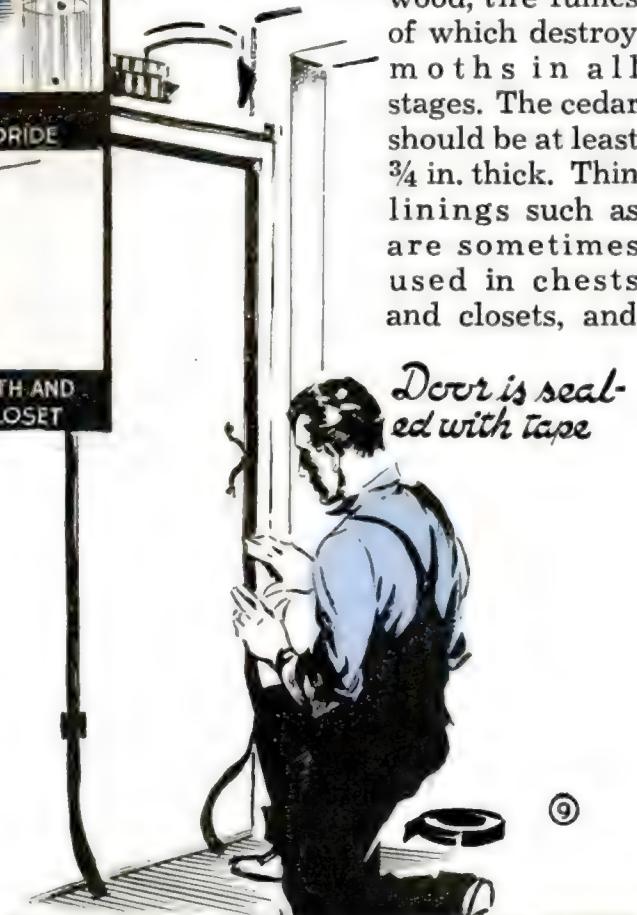


is assured only as long as the preparation emits fumes, unless the container is sealed tightly so moths cannot get inside. Small articles, such as fur-lined gloves, caps, etc., may be stored conveniently in glass or metal containers as suggested in Fig. 10. For larger garments heavy paper bags which are completely sealed with gummed tape generally prevent the entrance of egg-laying moths and retain the fumes for a time. Wrapping with heavy paper, taking care to fold and seal all edges, is equally valuable. The beliefs that newspapers have special virtue because of the ink and that tobacco keeps moths away, are apparently unfounded. Clothing stored in a closet may be protected by partitioning the closet, as in Fig. 6, and sealing all crevices and cracks in the wall, baseboard and floor with plastic wood putty. Before sealing garments in the closet, as in Fig. 9, they should be brushed thoroughly and hung in the sun. As an added precaution, a pad soaked in carbon tetrachloride, as shown in Figs. 7 and 8, should be hung at the top of the storage compartment. The fumes of this chemical are heavier than air and therefore settle to the bottom.

"Mothproof" paper bags of various types, which are on the market, are often impregnated with tar or pine and cedar oils.

According to the U. S. Department of Agriculture, (Farmers' Bulletin No. 1353) such bags are just as effective as ordinary bags made of plain paper, but only if properly sealed. The value of any bag as protection against moth infestation ceases as soon as it is torn, even slightly, or if it is left unsealed. For sealing, gummed tape is best.

Cedar chests are only effective when they are tight and contain volatile oil in the heartwood, the fumes of which destroy moths in all stages. The cedar should be at least $\frac{3}{4}$ in. thick. Thin linings such as are sometimes used in chests and closets, and



even the thicker stock, loses its strength in time, so that the chest is no better than a tight box. Any tight chest can be made mothproof by cementing a strip of sponge rubber around the top, under the lid, as shown in Fig. 14, and applying some method to hold the lid down tight. Garments or bedding placed in the chest should be packed with flakes as an added precaution. As both naphthalene and paradichlorobenzene discolor some fabrics, if placed directly on them, the flakes or balls should be wrapped loosely in tissue paper before folding into garments. Fig. 14 also shows a practical method for partitioning off a chest so that certain articles, which may be required, can be removed without exposing the balance of the contents.

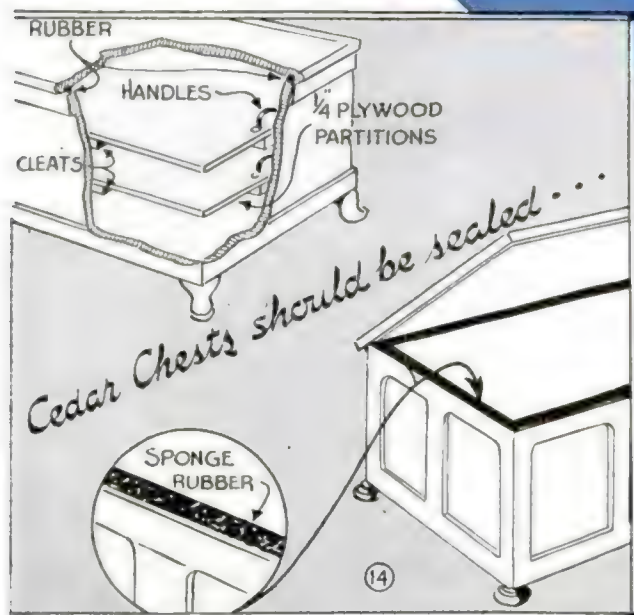
If rugs or upholstered furniture have become infested, moths, eggs and larvae must be eliminated completely to prevent further damage. Rugs in daily use are seldom attacked but when the room is undisturbed for several weeks, damage may be done. Should this happen, send the rugs to a professional cleaner at once or give them the treatment suggested in Figs. 3, 4 and 5. Upholstered furniture usually becomes infested from within so you may be unaware of it until some damage is evident. The space around

30¢ 42¢
Rubberized bag for treatment with fumigants
needed

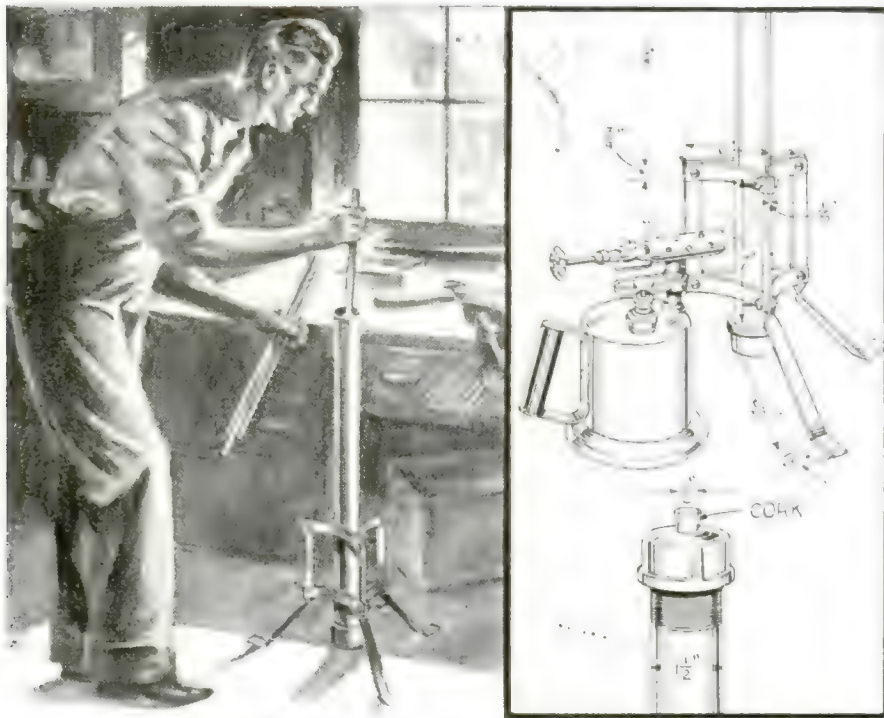


the springs makes an ideal place where the moths may live for many generations without leaving the article. If fumes from some of the flakes can be confined inside of a piece of furniture for several hours, by covering it with blankets or a rubberized cover as shown in Fig. 11, all stages of the moth will be killed. To accom-

plish this the flakes must be scattered liberally throughout the interior, as shown in Fig. 13, as well as in all external folds. Spraying with some fluoride, or cinchona alkaloid solution, is also effective provided the fabric is thoroughly saturated with the solution so that the fibers will be impregnated. This can be accomplished with a power sprayer but hand sprayers are of doubtful value. In using any spray, make sure that it will not stain the particular fabric to be treated. The solution suggested in Fig. 12 is effective, non-inflammable, but as it is slightly toxic, be sure to provide sufficient ventilation.



'Standpipe' Pressure Steamer Handles Wood Strips Quickly



A simple steamer that will soften light strips of wood in 10 to 20 min. so that they can be bent

Having need of a steamer for light wood-bending jobs, I made the one shown which takes flat strips up to $1\frac{3}{8}$ in. wide and 3 ft. long. The steamer consists of a length of $1\frac{1}{2}$ -in. pipe capped at both ends and supported by a flat-iron stand. The upper cap is drilled for a cork, which serves as a safety valve against too high a steam pressure. In use, the pipe is filled with water to a depth of about 15 in., the wood strips inserted and a blowtorch flame directed against it as indicated. Most wood strips will be sufficiently pliable for bending in 10 to 20 min. When bending small strips, they can be held in position on an improvised form, set in the stove oven and dried in almost the same time, thus speeding up the job considerably.

—Dale R. Van Horn, Lincoln, Nebr.

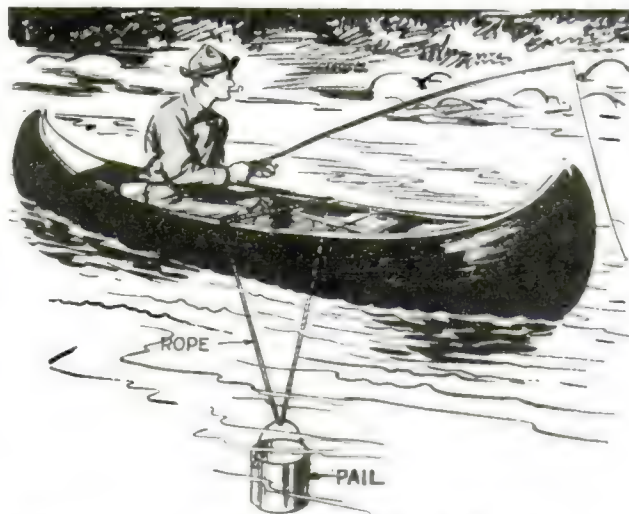
Removing Stain from Photo Prints

Amateur photographers who do not have running water for washing prints often find a slight yellow stain on their dried prints. A cure for this staining—when caused by an organic condition of the wash water—is to dissolve potassium oxa-

late, 1 oz., in water, 20 oz. After the prints have been washed for about three-quarters of the washing time, remove them from the water and soak them in this solution for about 5 min. or longer if the stain is bad. Then finish by washing about a half hour, and drying in the usual manner. This solution will not remove stains caused by contamination or exhausted solutions. After repeated use, the solution sludges and turns yellow. However, this condition appears to have no effect on its action. I have used 2 gal. to treat the equivalent of one thousand 8 by 10-in. prints, and its action is still as rapid as when mixed.—Melvin Kennard, Gasport, N. Y.

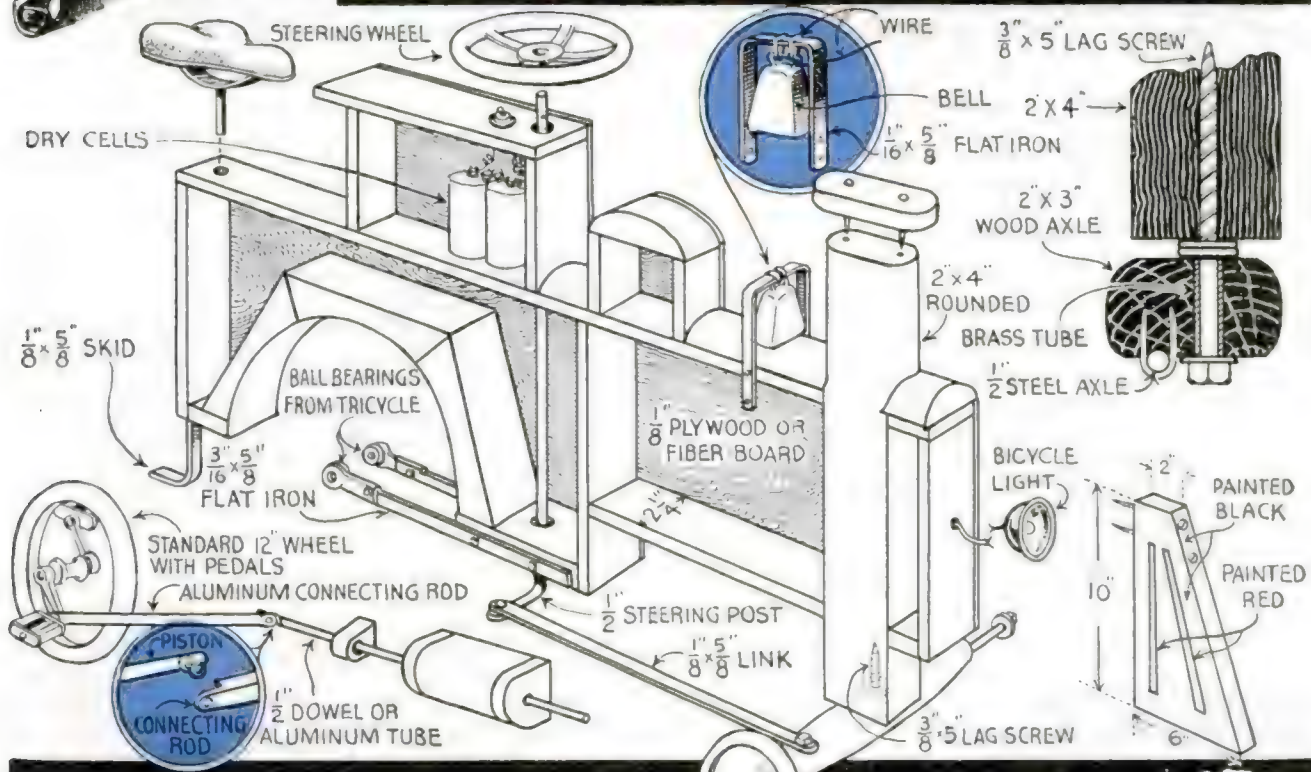
Pail and Rope Stabilize Canoe for Fisherman to Cast

By suspending an open pail with ropes under the center of a canoe it may be balanced safely against tipping when the oc-

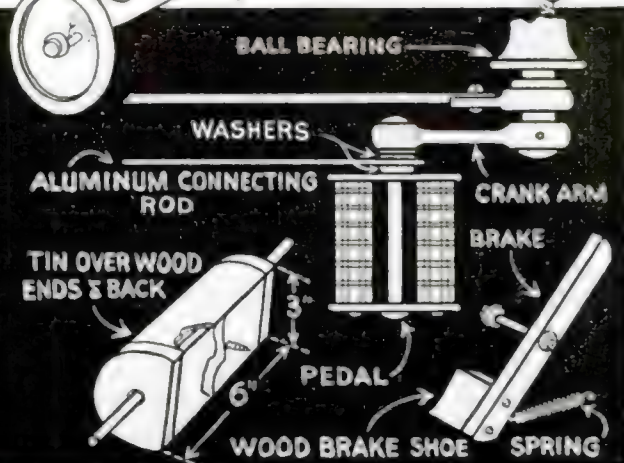


Tendency of a light canoe to roll when casting is greatly reduced by this stabilizer

cupant moves quickly to cast or reel his line. Just run the rope through the bail, tie the ends together and then slip it over one end of the canoe.



Using parts of a tricycle, an old coaster wagon and some thin plywood or hard-pressed board, you can build this sidewalk locomotive at very little cost, and when finished in a glossy black lacquer with red trim and brass bands, it will be the envy of all your friends. White pine or other light wood is used for the framework, which is covered with panels cut as shown in the squared detail. The original ball bearings for the drive wheel are removed from the tricycle and are installed on the ends of iron bars. Dry cells, a bicycle lamp and a bell add to the completeness of the little mogul. The saddle should be set up on a block



Bicycle Locked Against House with Iron-Rod Holder



Simple holder keeps bicycle against building and permits locking to discourage theft

To hold his bicycle upright against the side of a house, and also to provide a means of locking it, one boy used the simple holder shown. It is made from a length of steel rod bent to a U-shape with opened eyes formed on the ends to be closed over screw eyes driven into the side of the house. The closed end of the holder is bent to fit over the bicycle frame so a short chain and padlock can be used.

Sponge-Rubber Bait for Catfish

Anglers who know the lure of chicken blood for catfish and bullheads, but have difficulty in keeping the bait on a hook,



will find this idea an improvement. Cut a small piece of sponge rubber, the size depending upon the hook to be used. Run the hook through most of the rubber and tie the

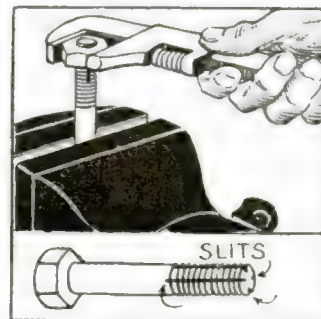
upper tip to the shank of the hook with silk thread. Several hooks are prepared in this manner and each provided with a 2 or 3-ft. length of line. Each bit of rubber is then immersed in the blood and worked with a stick until the rubber is filled, after which the hooks are laid in the sun to dry.

Once dry, considerable water action is required to remove much of the bait. Before putting it away, the sponge should be washed out and then dipped in a strong brine solution.

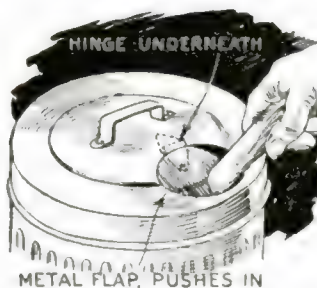
Slits in Threaded Part of Bolt Clean Nut Threads

If the nut on a bolt is too tight because of dirt in the threads, and there is no tap available, file slits in the threaded portion of the bolt.

The edges of the slits will tend to clean the nut threads as it is driven onto the bolt. The same idea can be carried out to clean bolt threads by filing slits in the threads of a nut.



Opening in Garbage-Can Lid Admits Light Refuse



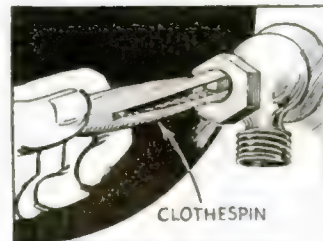
Instead of removing the lid from your garbage can every time you want to drop in a little rubbish, cut a round opening 5 or 6 in. in diameter in the lid

as shown, and hinge a metal flap to cover it. Use a spring hinge so that the flap will stay closed, and fasten the hinge on the underside of the lid with small stove bolts.

Key-Operated Faucet Opened with Clothespin

If you happen to lose or misplace the key to a water faucet, try using a clothespin to open or close it. If the faucet valve does not operate too hard, the pin will usually do the trick.

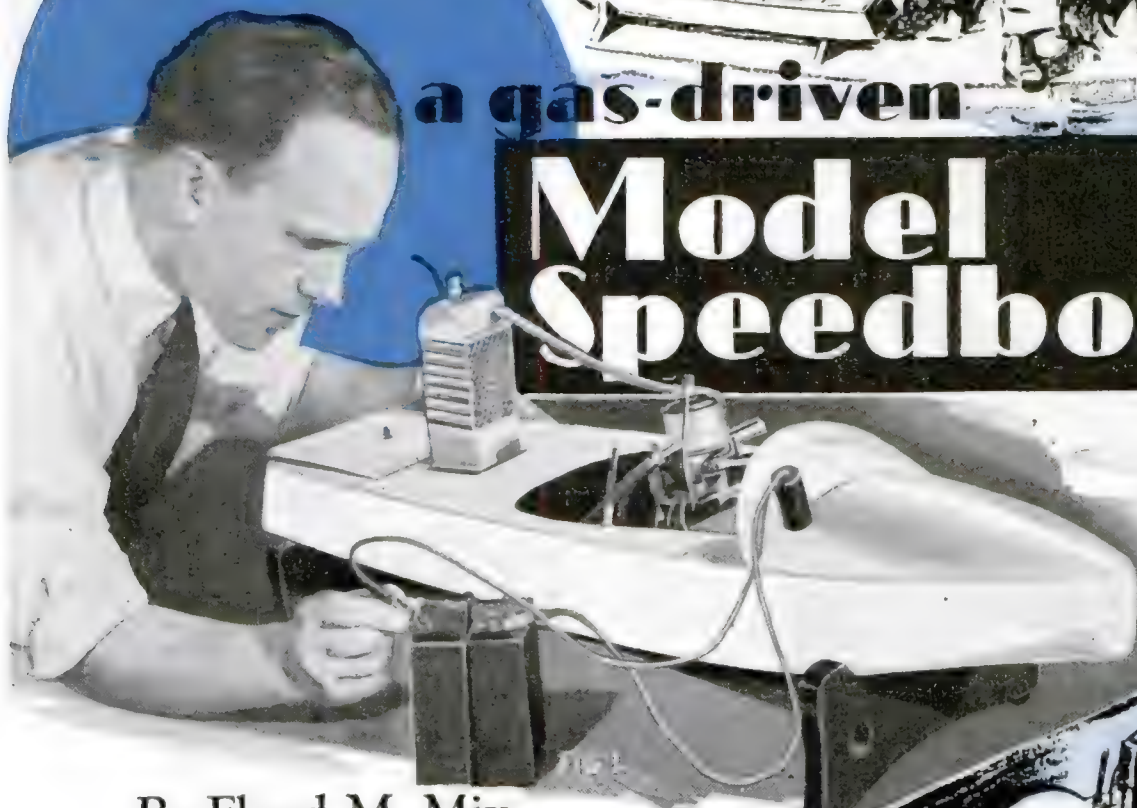
Just push the legs of the pin over the squared shoulder of the valve and twist it.



"Sea-Bee"

a gas-driven

Model Speedboat



By Floyd M. Mix

THIS 32-in. motorboat, designed by F. E.

Ludolph, of Chicago, is powered by a 22-oz. midget gas engine that develops approximately $\frac{1}{3}$ hp. at 5,000 r.p.m., and drives the boat on a circular course at a speed of 30 to 35 m.p.h. The job of building the boat is not difficult, and by starting now, you can get one finished in plenty of time to use this summer, and compete in the National races this fall.

Assuming that all of the items specified in the material list at the end of this article are at hand, let's get right into the constructional details. The frames dimensioned on print No. 965 are made from birch plywood, Nos. 1, 3, 5 and transom from $\frac{3}{8}$ -in. stock and Nos. 2 and 6 from $\frac{3}{4}$ -in. stock. To obtain full-size patterns of the frames, rule sheets of kraft paper into 1-in. squares, then sketch the patterns of the half frames given in the small squares into the large ones freehand. Fold the paper along the center line with the pattern on the outside and cut along this line with a pair of scissors to make both sides symmetrical. Then you fasten the patterns on the plywood, using rubber ce-

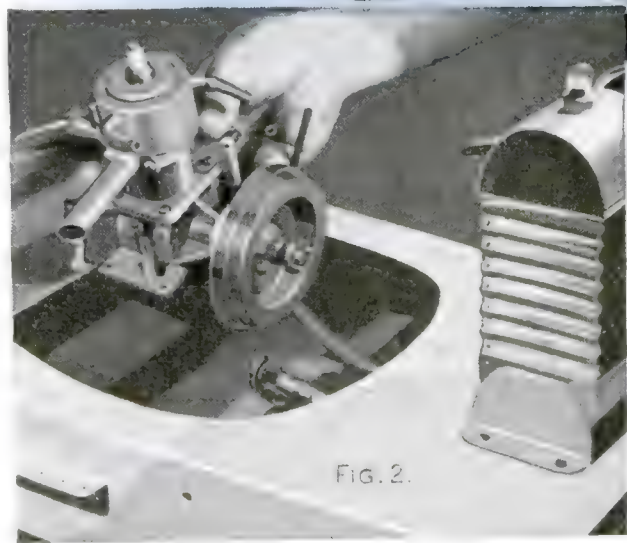
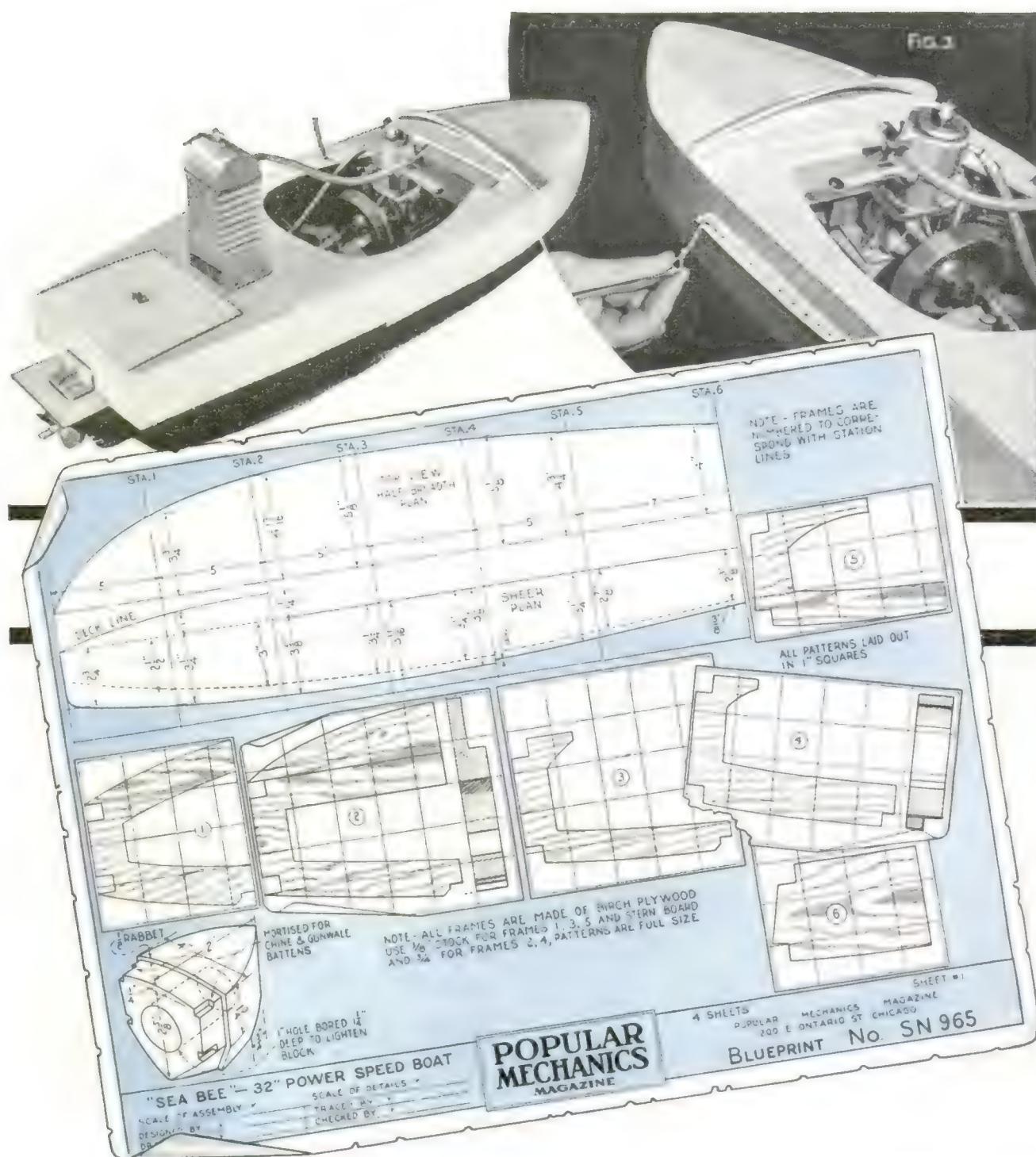


FIG. 2.

ment, and scroll-saw the frames to shape, Fig. 7. Cut the nose block from a piece of birch or white pine 2 by 3 by 6 in. in size. Carve the block to approximate shape and

After Letter to Mix.



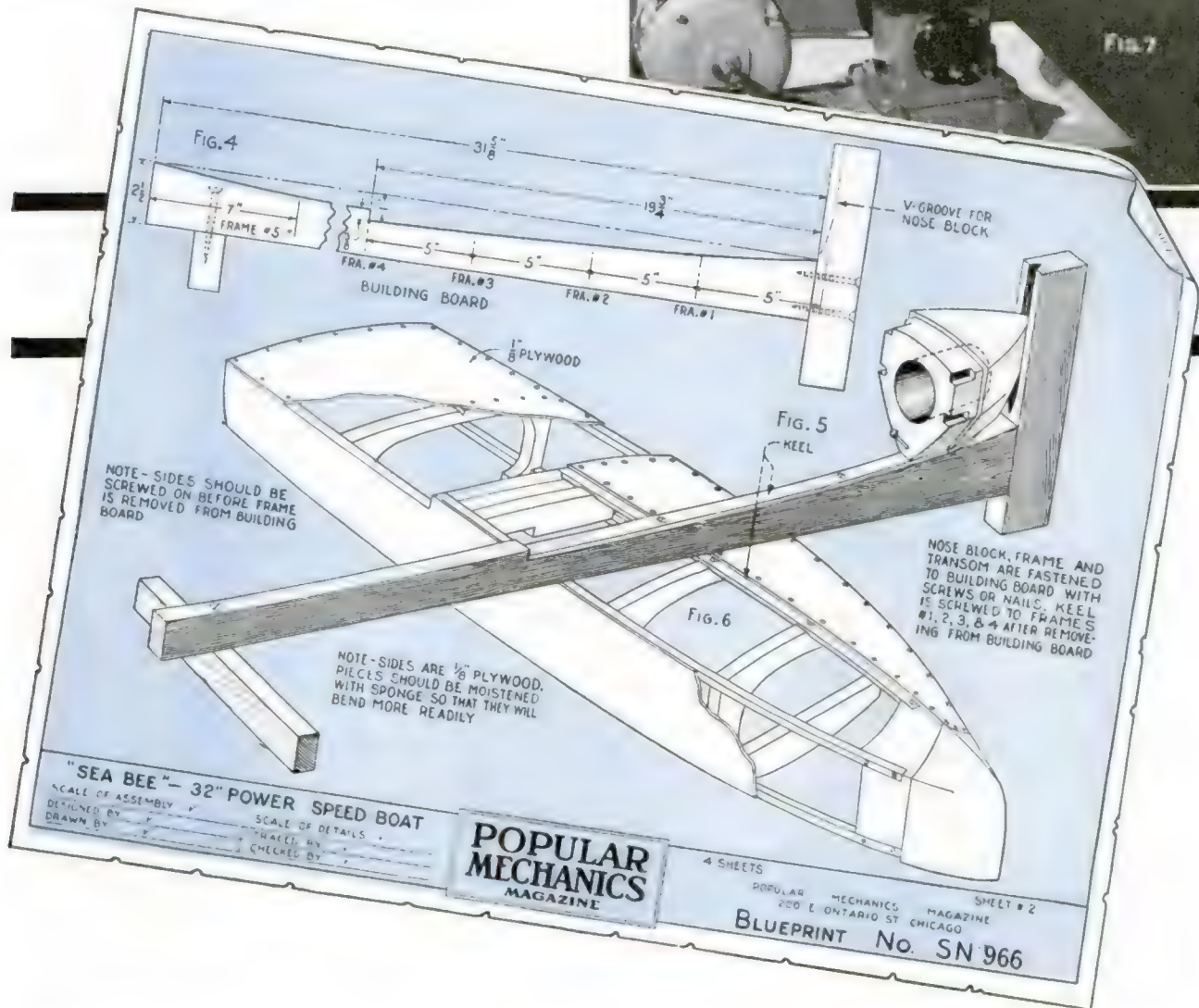
rabbit it $\frac{1}{8}$ in. as indicated. Also, rabbit frames 2 and 4 as shown in the end view of these pieces.

The framework, Fig. 10, is assembled on a building board or form, the upper side of which is cut to the contour indicated in Fig. 4. Aside from temporary nailing required to fasten the frame pieces to the form, all parts of the model are fastened in place with flat-head brass screws and waterproof casein or marine glue. Also, all of the wood surface must be shellacked and given a couple coats of marine paint of the desired shade to protect it from the mois-

ture. Naturally this must be done as the work progresses otherwise part of the inner works would be inaccessible.

Now to get started with the assembling: The keel is fastened to the nose block and then to the building form as shown in Fig. 5. The frames are placed in their respective positions as indicated in the half-breadth plan, print No. 965, and toenailed in place with 1-in. wire brads. Both chine and deck beams are $\frac{3}{8}$ in. square, being ripped from a piece of clear white pine about 36 in. long. These pieces are heated thoroughly over a gas burner so they will

bend without breaking, then fastened to the frames with glue and No. 4 f. h. brass screws, $\frac{5}{8}$ in. long. The heads are countersunk to allow for evening up the frames in preparation for the planking. All planking is $\frac{1}{8}$ -in. birch plywood, and it is glued and screwed to the frame pieces with No. 0, $\frac{3}{8}$ -in. f. h. brass screws. To avoid waste of material and to aid in getting the plywood shaped properly, it is a good idea to make up cardboard patterns of the various pieces required. Where necessary, the



frames are dressed down with a rasp to insure a good fit at all joints. After all the frames have been attached, the side planks are put on. Contacting surfaces are smeared with glue and C-clamps used to hold the wood in place until the screws are driven in. About four screws, staggered to prevent splitting, will be required for each frame piece. After both side planks are in place, the model is removed from the form and the keel is fastened to frames 1, 2, 3, and 4. Fig. 6 shows details

on the bottom planking. By sponging the pieces with warm water, they can be bent readily to the contour of the framework.

Now build a cradle for the model from $\frac{3}{4}$ -in. plywood, as shown in Fig. 18. The motor base, Fig. 9, and the drive-shaft support just ahead of frame No. 4, come next. A battery compartment, which accommodates the four flashlight cells required to operate the engine, is illustrated in Fig. 16. When the battery compartment is in place and a cover made for it, as dimensioned in



As soon as all of the drive-shaft mechanism is lined up, you can go ahead with the deck planking, Fig. 11. Start with the forward deck, covering it with $\frac{1}{2}$ -in. strips of $\frac{1}{8}$ -in. plywood. Put on the middle plank first, then gradually work toward the sides. The aft deck is covered with a piece of the same material, openings being cut in it as shown in Fig. 13. On print No. 967, Fig. 12, you will find dimensions for the windshield and mold-

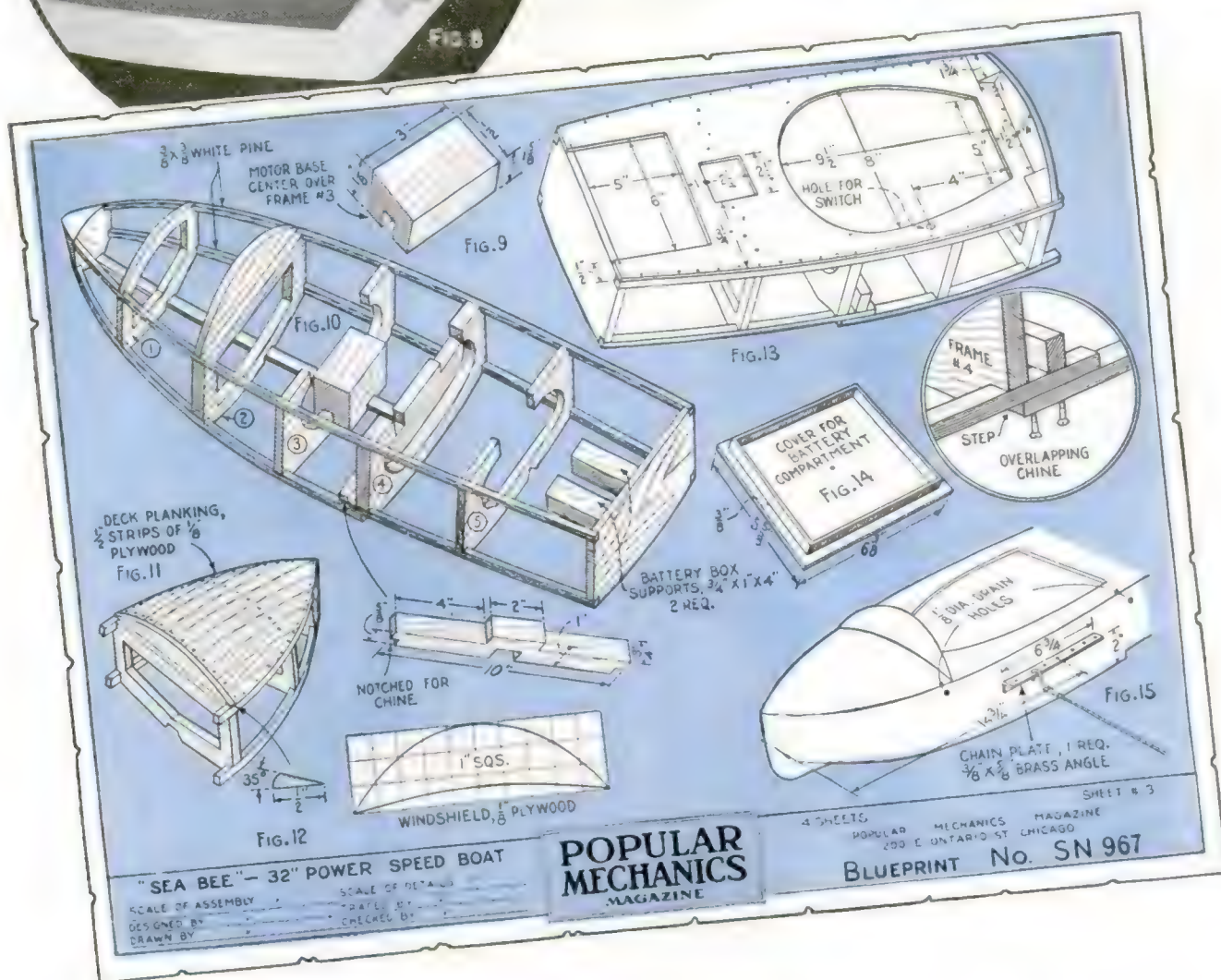
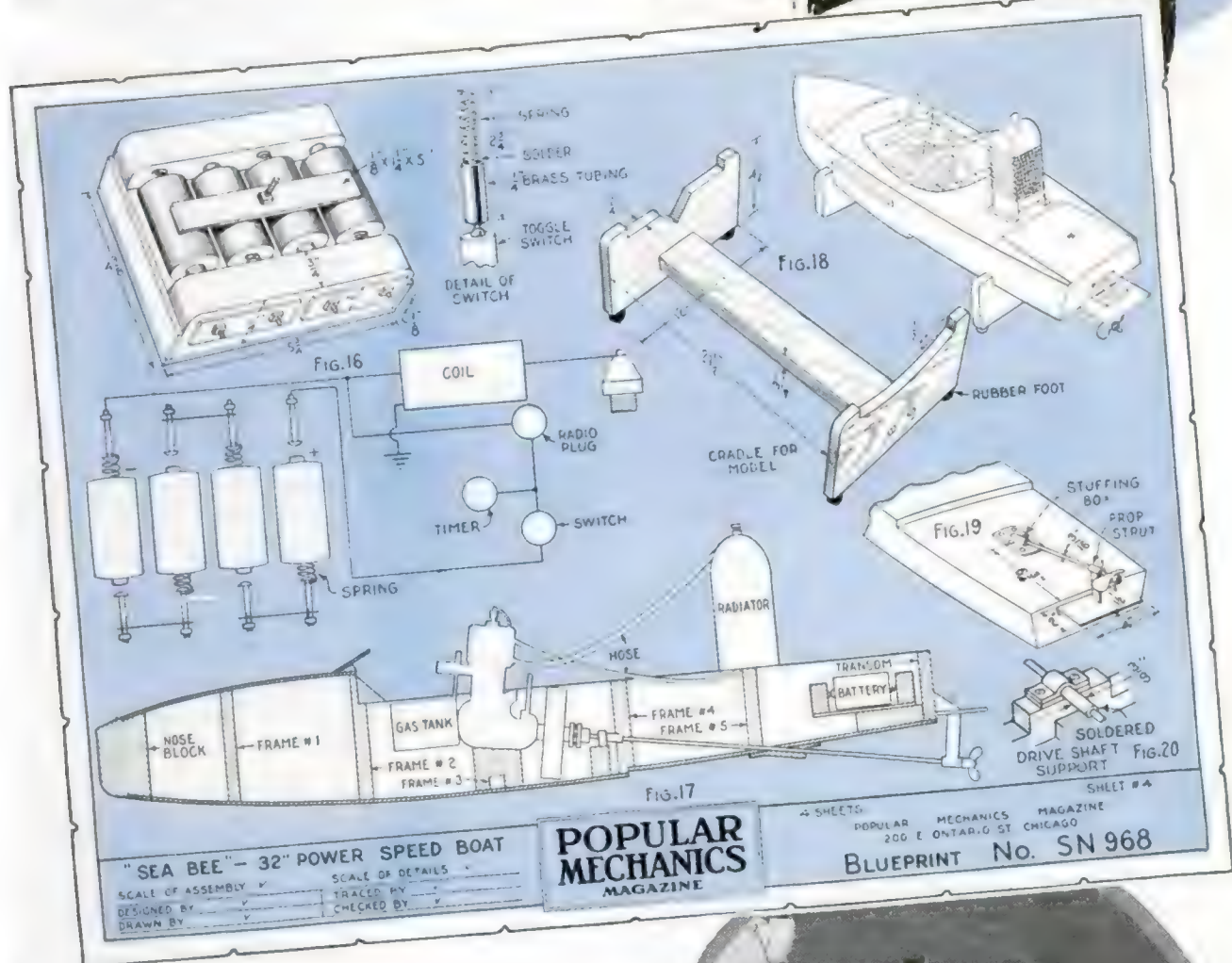


Fig. 14, you can go ahead with the preliminary wiring, using small staples to anchor the wires to the side of one of the deck beams. Notch the top edge of the frames where necessary. Be sure the wires are left long enough to make all the necessary connections after the engine has been installed and the top decking applied. Refer to Figs. 8, 17, 19 and 20 for data on the drive-shaft and propeller installation. To provide a thrust bearing for the propeller shaft, slip a $\frac{3}{4}$ -in. length of $\frac{1}{4}$ -in. brass tubing over it and solder it in place just back of the bearing.

ing to which it is attached. With the windshield on, the main construction is finished, but there's still several odd jobs to clear up. A radio plug must be installed in the forward deck, Fig. 1, so you can use an auxiliary battery for starting, and a switch, detailed in Fig. 16, mounted on the aft deck, to stop the engine at the close of a race. Then there's the chain plate, Figs. 3 and 15, and the installation of the motor, Fig. 2, radiator, and $1\frac{1}{2}$ -in. propeller. For the outside finish on the boat use a coat of thin shellac, and a couple coats of marine paint of the desired shade, sanding

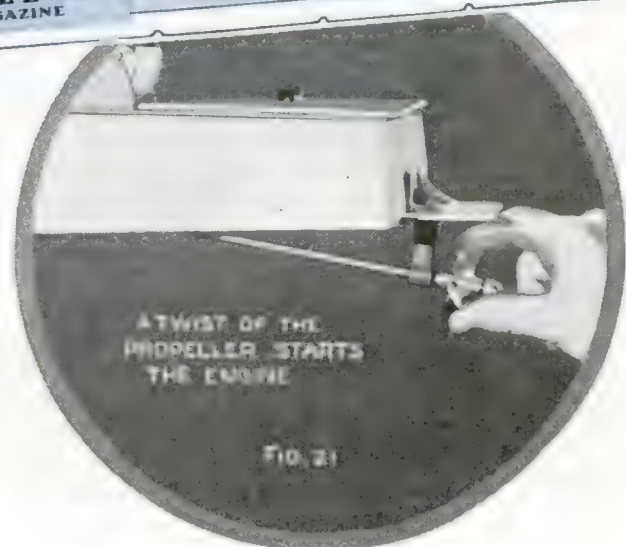
lightly between coats. When ready for a trial run, the model is placed on the cradle and the engine started by twisting the propeller as in Fig. 21. Speed is controlled by adjusting the carburetor needle valve, spark and choke valve before placing the model in the water. A tank of fuel will run the motor from 15 to 20 min.

For a circular race course the boat is attached to a 50-ft. line which pivots on a pole not over 4 ft. above the water level. The model making the best time in a race of not less than three consecutive circular laps is considered the winner.

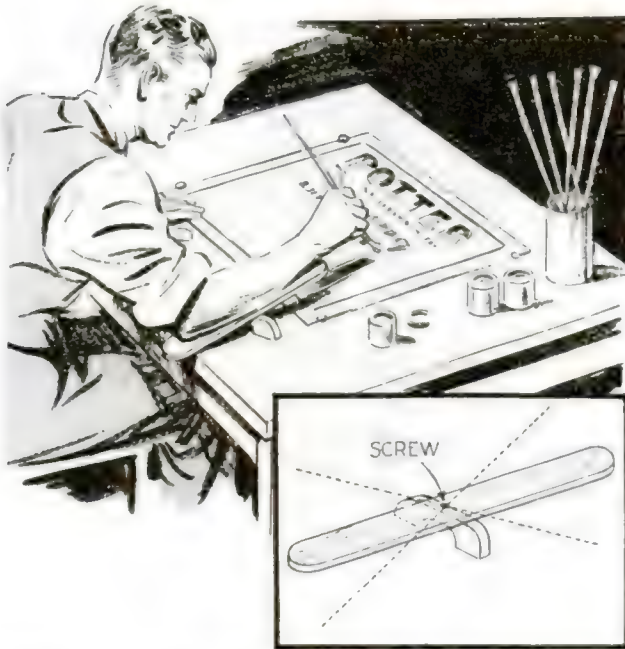


MATERIAL LIST

- 1 pc. $\frac{3}{8}$ x24x36-in. birch plywood—frames
- 1 pc. $\frac{3}{4}$ x12x12-in. birch plywood—frames
- 1 pc. $\frac{3}{4}$ x18x24-in. birch plywood—cradle, battery box
- 1 pc. 2x3x4-in. birch—nose block
- 1 pc. $\frac{3}{8}$ x3x36-in. white pine—chines, deck beams
- 2 pc. $\frac{1}{8}$ x24x36-in. birch plywood—planking, windshield
- 1 pc. 2x4x12-in. white pine—motor base, miscellaneous
- 1 pc. brass angle $\frac{3}{8}$ x $\frac{3}{8}$ x $\frac{3}{4}$ in.—chain plate
- 1 pc. $\frac{3}{16}$ -in. steel rod approx. 20 in. long—drive shaft
- 1 $\frac{1}{2}$ lbs. No. 0, f. h. brass screws $\frac{3}{8}$ in. long
- Universal joint, prop strut, stuffing box, shaft bearing, propeller
- Marine glue, several sizes of wire brads and screws



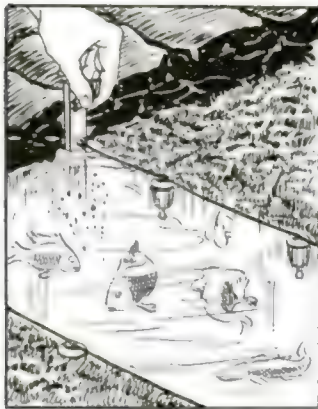
Pivoted Armrest Relieves Strain When Lettering Show Cards



When producing show cards in quantities this armrest will relieve muscle strain considerably

An armrest for show card writers, that relieves muscle strain when producing cards in quantities, can be made easily from two pieces of wood as indicated. The rest pivots on a supporting cleat so that the arm can move back and forth.

Plant Retractor for Aquariums



CORD
COUNTERBALANCE
WOOD OR CORK FLOAT
SCREW EYE

Surface plants and other floating vegetation, which often interfere with the proper feeding and rearing of pond and aquarium fish, may be confined to any desired area by using a light woven cord, supported at intervals of about 14 to 18 in. by small wooden or cork floats. This method of

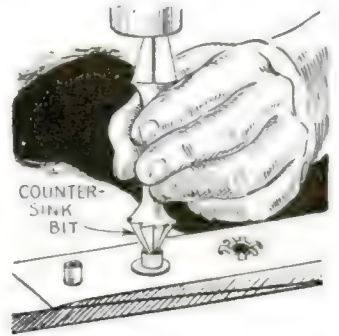
segregating the plants in one section does not cause any interference with the feeding or breeding habits, and can in no way injure the most delicate plant or fish. The line can be fastened by means of wire or

small hooks imbedded in the walls of the tank. Some may prefer to paint the floats to harmonize with the scheme of the plant life of their pond.

—W. J. Schroll, Garwood, N. J.

Emergency Setter for Rivets

If you have a repair job that requires the use of tubular rivets and there is no tool at hand for splitting and clinching the ends, try using a countersink. Just set it on the projecting ends of the rivets and strike it lightly with a hammer.



—Andrew Vena, New York.

Whitewashing Porous Surfaces

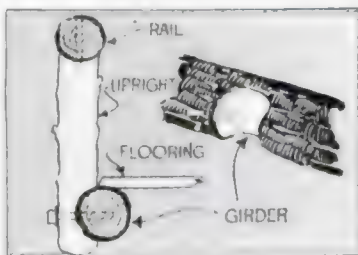
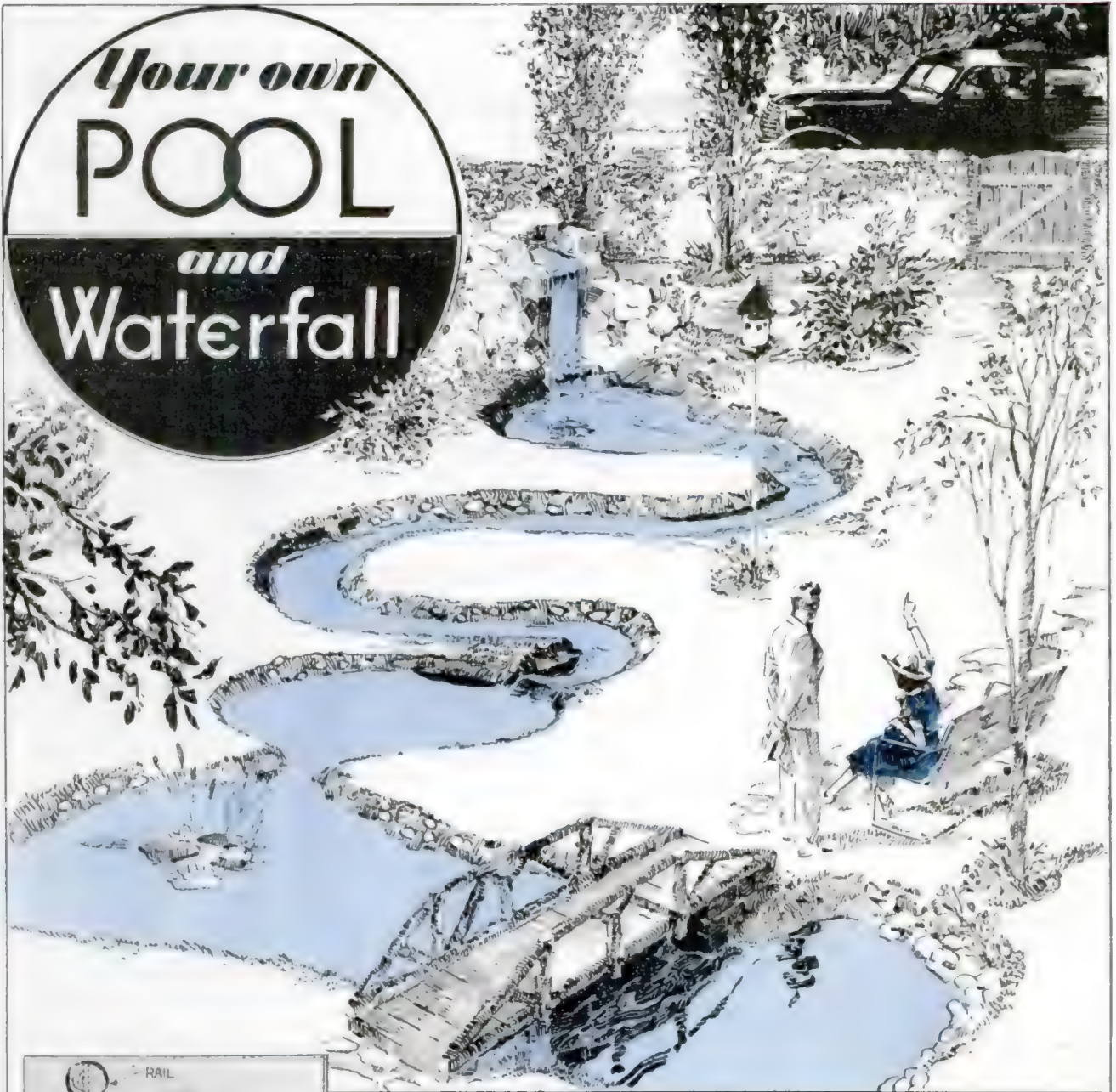
Before whitewashing a brick or terracotta wall or other porous surfaces, wet them lightly with water thrown on with a brush. This reduces the suction of a too dry surface and permits spreading the whitewash evenly and thinly, as the water in the mixture is not absorbed too rapidly. A given quantity of whitewash will also cover more surface and require far less labor to apply it neatly on a wet wall. If the wall is very dry and warm, such as a boiler room, it may be necessary to wet it generously—possibly with a garden hose.

Tin Cans Make Handy Bins for Nails and Screws

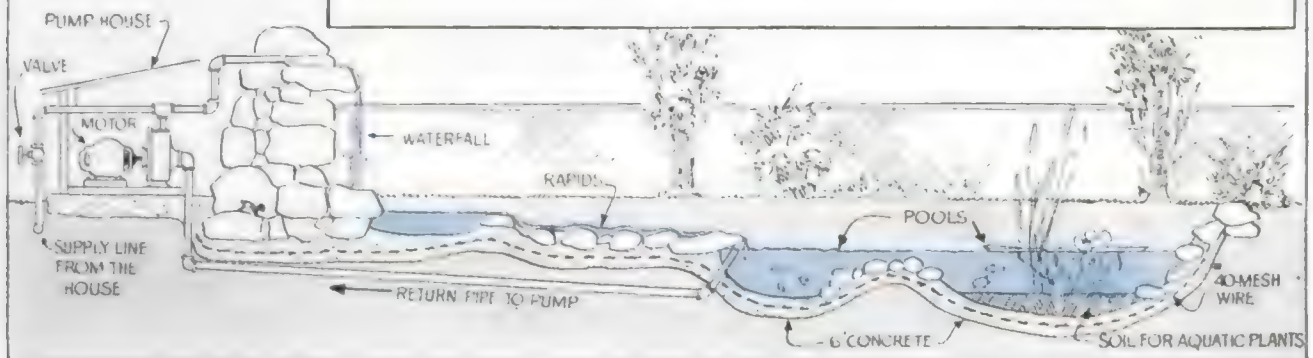
Small nail and screw bins which will slip under tack or nail heads driven into the underside of a shelf or bench top can be made in a jiffy from tin cans.

Just slit the cans lengthwise on one side, and bend the severed edges outward. Taper the edges toward the rear end with a pair of tinners' snips and solder a handle to the front end.

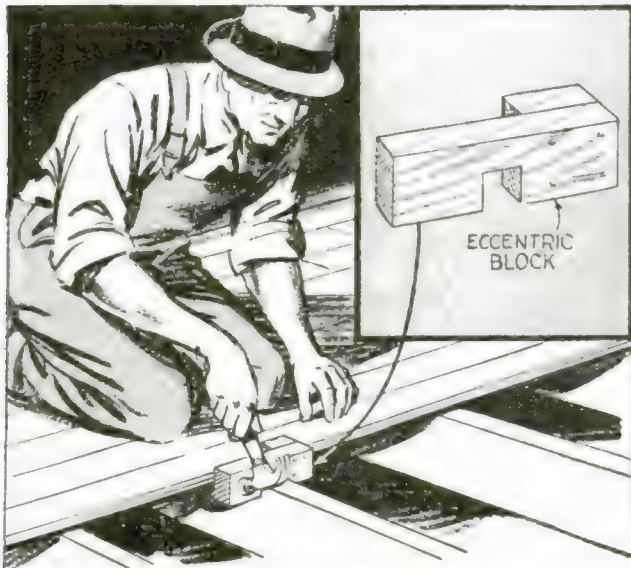




Using the same water over and over again, by means of a small centrifugal pump, such as an old auto pump, this garden pool and waterfall plan can be applied to the small back yard or expanded to suit a small estate. Bottom and sides of the pool should be of concrete on well-compacted earth and the concrete should be reinforced with heavy wire mesh. All piping should be concealed and both motor and pump should be housed to protect them against the weather. Additional attractiveness is possible by building up the banks with layers of limestone



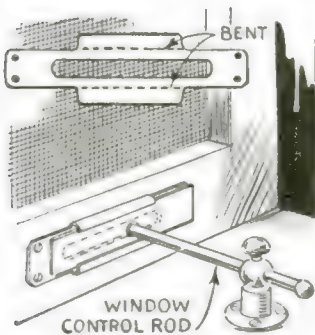
Block to Hold Flooring Tight While Nailing It to Joists



With this block, you can drive flooring boards in place and hold them for nailing

Here's a block that not only allows warped flooring to be driven into place without damage to the tongue or groove, but holds it in place while being nailed. A 4 by 4-in. block is slotted to slide easily upon a 2-in. joist, and a 2 by 4-in. block is nailed onto this at one end. In use, the block is slid against the flooring strip and struck with the hammer at the thick end. When the flooring is fitted firmly together, a light blow with the hammer at the opposite end of the block imparts a twist or lock to the device that will prevent the board from springing out of place while it is being nailed to the joist.

Bug-Proofing Casement Windows



Here is an easy way to keep insects from entering a house through the control-rod opening in the screens of casement windows. Cut a strip of copper or galvanized iron to the

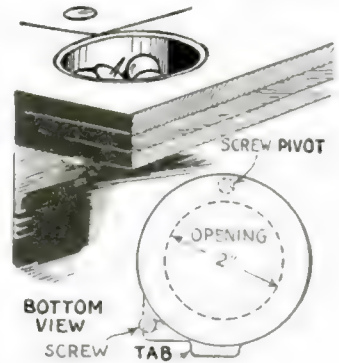
shape shown, making it sufficiently large to overlap the entire opening. Then bend over the ears, indicated by the dotted lines, and cut another strip to serve as a slide between them. Drill a hole through the

center of the slide to take the control rod and mount the assembly in place.

—K. F. Keith, St. Petersburg, Fla.

Thumbtacks Kept in "Pocket" in Drawing Board

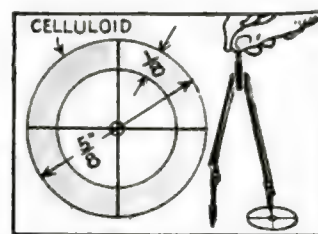
To avoid pricking his fingers on thumbtacks, when picking them out of a box or dish, one artist made a pocket with a swinging bottom at one corner of his drawing board. The pocket is made by boring a large hole through the board with an expansive bit and fitting a sheet-metal disk



over the bottom with one small wood screw. The disk has a tab extending beyond the edge of the board so that it can be pushed over to let the tacks drop out.

Celluloid Shield for Compass Leg Protects Drawing Board

To avoid marring a drawing with perforations made by the leg of a compass, use a $\frac{5}{8}$ -in. clear celluloid disk on which to set the leg of the compass. Two lines



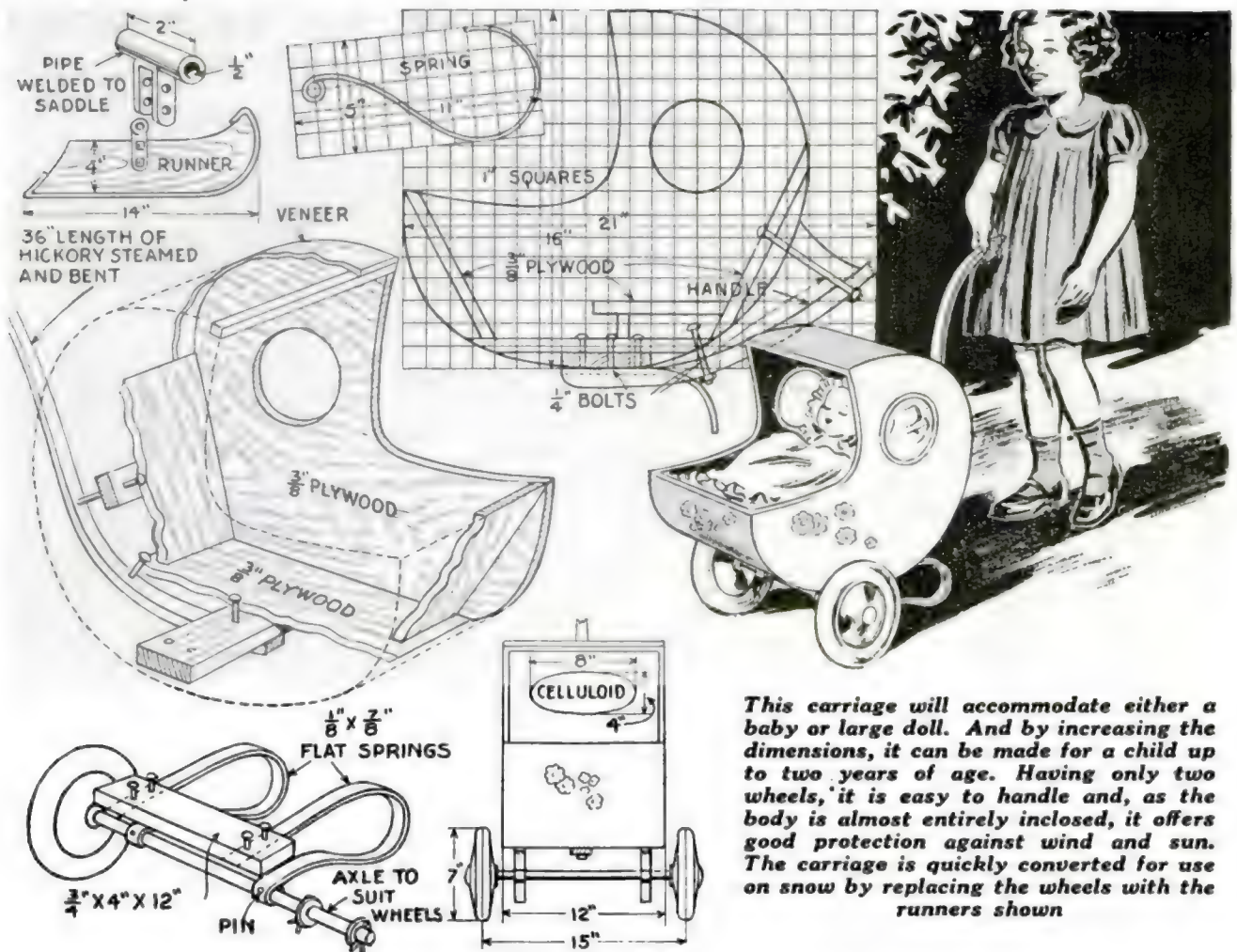
are drawn across the disk at right angles with their intersecting points in the center of the disk, after which a thin coat of rubber cement about $\frac{1}{8}$ in. wide

is applied to the reverse side. This is allowed to dry thoroughly. In use, the disk is placed on the drawing with the cement side down and the intersecting point of the lines directly over the place where the compass leg is to be set.

—Robt. E. Davy, Represa, Calif.

Picture frames should have thumbtacks at each lower corner and on the bottom edge to hold the picture away from the wall. Otherwise a dirty line usually shows when a picture is taken down.

Plywood Doll Carriage for Winter or Summer

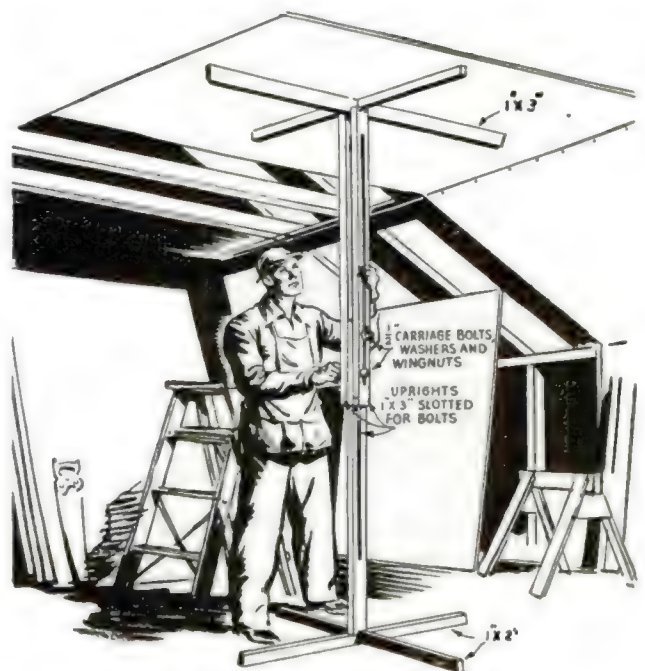


This carriage will accommodate either a baby or large doll. And by increasing the dimensions, it can be made for a child up to two years of age. Having only two wheels, it is easy to handle and, as the body is almost entirely inclosed, it offers good protection against wind and sun. The carriage is quickly converted for use on snow by replacing the wheels with the runners shown

Wallboard Supported by Standard While Nailing to Ceiling

The problem of applying large sheets of wallboard to ceilings single-handed is solved with this standard, which can be adjusted to support the sheet while nailing it in place. The standard consists of three lengths of 1 by 3-in. stock, two of which are nailed to a cross of 1 by 3-in. stock at the top and telescope over the third length which is nailed to a second cross to serve as a base. The 1 by 3-in. members are slotted lengthwise to take bolts with which the adjustment of the standard is locked.

When electric-light switch plates become dark and discolored, they can be restored to their original brightness by washing them with vinegar, after which transparent metal lacquer is applied to preserve the finish. Of course, the plates must be removed from the wall while this is being done.



The difficult job of holding a sheet of wallboard in place on a ceiling is made easy with this standard

New FLOWER STANDS



By WALTER T. WARDE

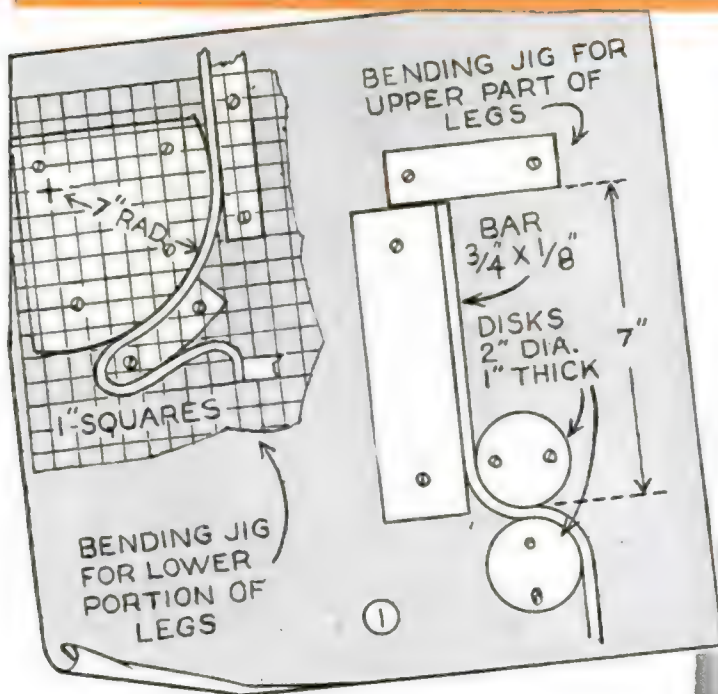
Familiar pieces of household furniture given new color and styling by the use of gleaming metal, polished wood and brilliant plastics

THESE variations in fern or flower stands, a large one to accommodate several plants, and two individual ones, all done in modern styling, are interesting jobs for the craftsman who likes something in metal, wood and plastics combined. Details on one individual stand are given in Figs. 1 and 3, while those concerning the second one are shown in Fig. 5. In both instances you first make the bowl. This can be made by two methods. If you have metal-spinning equipment the bowl can be spun from aluminum sheet thus making a very beautiful job; if not, it can be made as the one shown in Fig. 3. The base of the bowl is turned from a wood disk as in the detail, and the outside enameled black, the upper part being of No. 20-ga. sheet aluminum rolled to shape and screwed in position or held by crimping the edges. The top rim of $\frac{1}{8}$ by $\frac{1}{4}$ -in. aluminum bar is bent to the correct diameter, enameled black and screwed to the

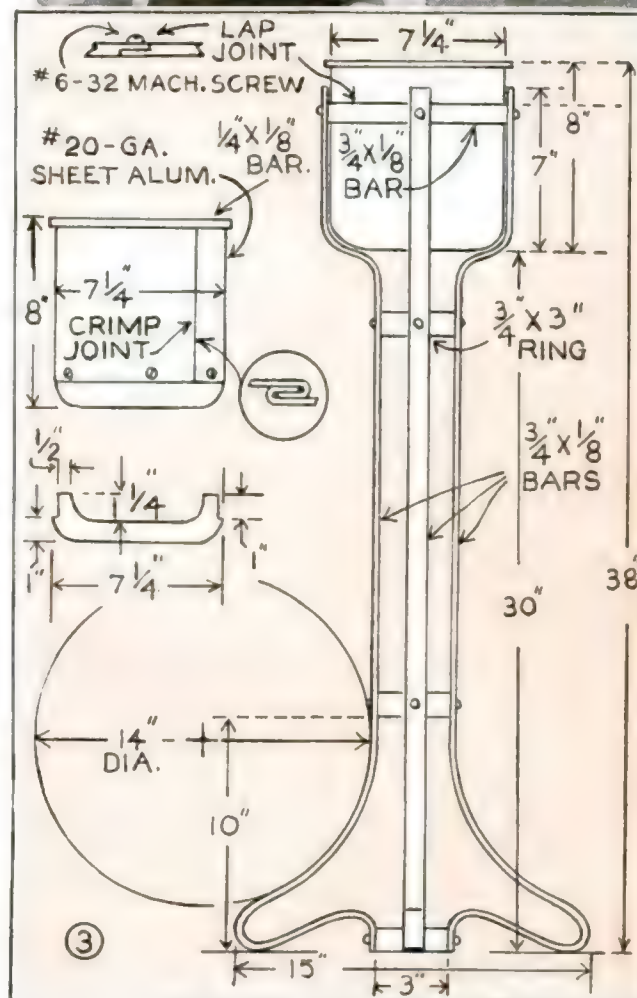
top edge of the bowl at the joint and some "liquid solder" applied inside the rim to hold it in place. The inside of the bowl is painted with acid-proof paint. The bending of the legs is a simple operation if the method shown in Fig. 1 is followed. Don't forget to polish before bending. The legs, of $\frac{3}{16}$ by $\frac{3}{4}$ -in. rectangular bar, are held together at the center column with two 1-in. rings cut from a 3-in. o.d. tube with a .065-in. wall. At the top the legs are held in position with a bar of $\frac{1}{8}$ by $\frac{1}{2}$ -in. aluminum bent to the required diameter and fastened with screws as in Fig. 7. The legs are held at the base with a 1 by 3-in. disk of wood overlaid on top and edge with $\frac{1}{32}$ -in. black Bakelite. You will find that casein glue is quite effective to hold the Bakelite provided the surface of the latter is roughened.

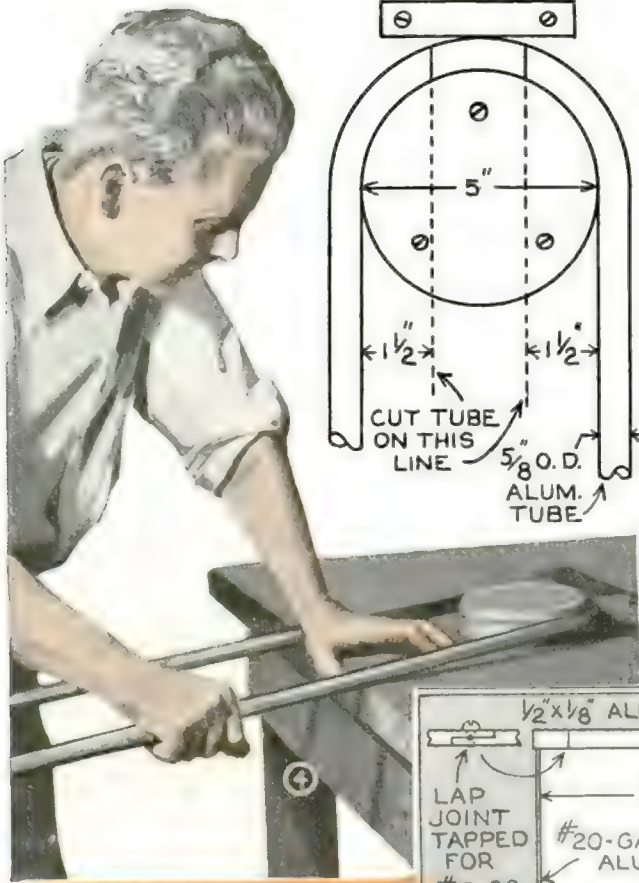
The procedure for the second individual stand is much the same. Start with the bowl, cutting the base from wood and

in Bent Metal



turning it as shown in Fig. 2. Dimensions of the turning are given in Fig. 5. The two lower rims of the bowl base are overlaid with No. 20-ga. sheet aluminum, using casein glue and one screw in each rim. The upper portion of bowl is a sheet of the same material bent to the required diameter and held in position by screws, or by crimping the joint. The upper rim is of 1/32-in. plastic of the same color as used on the base, glued to the bowl, or the rim may be a 1/8 by 1/2-in. rectangular aluminum bar, enameled the same color as the base and screwed in position. The inside is painted with acid-proof paint. This design differs from the previous one in that tubes instead of rectangular bars are used for the legs, and there are four legs instead of three. The method of bending the tubes is shown in Fig. 4 and is described in detail in the last paragraph of this article. Inasmuch as the legs take all the weight of the bowl, great care should be taken to get a firm, tight fit on the plugs which are inserted at the top of each leg. The base of the stand consists of two disks cut from 3/4-in. wood and overlaid with 1/16-in. laminated plastic on the top and 1/32-in. plastic on the rim. The legs are held in place with screws driven from the underside of the base and up into plugs in





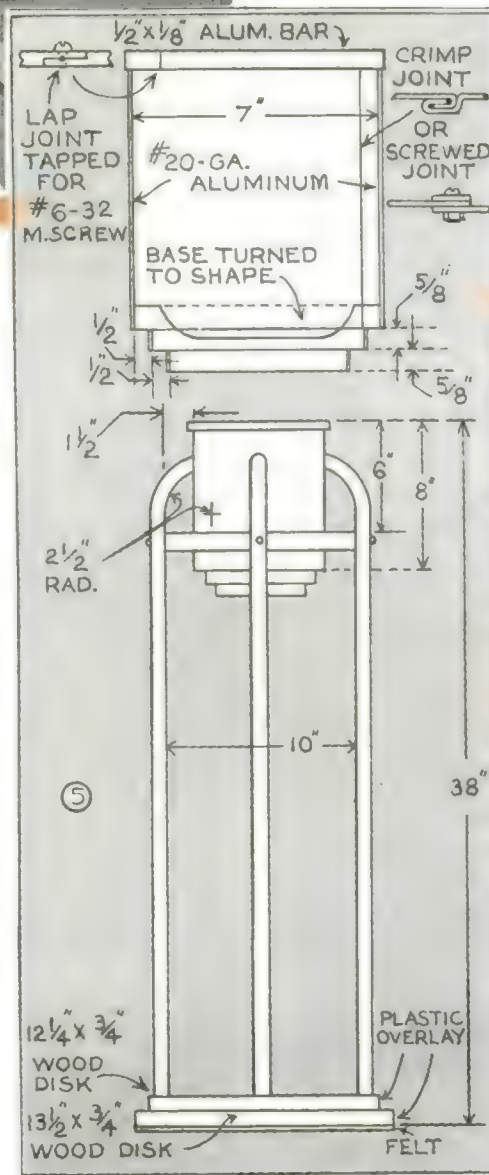
the legs. The underside of the base is covered with a piece of felt. The band inside the legs is of $\frac{3}{4}$ by $\frac{1}{8}$ -in. rectangular bar bent to the correct diameter and screwed to each leg.

Now for the roomy stand in which several plants or flowers can be grouped. This one is rectangular in shape and its dimensions may be varied somewhat to suit the size of a zinc tray, should you happen to have one from an older type of flower stand. Or, perhaps you can pick up such a tray in a secondhand store, although it's really not much of a job to make one that is water-tight, if you are handy at metal working. And, in case you build the tray yourself, follow the dimensions given in Fig. 9.

Then comes the box. This is made of $\frac{3}{8}$ -in. wood for the sides and bottom, the corners of the box being mitered and glued, and the bottom rabbeted into the sides. Having assembled the box, the wood should be stained a suitable color, the one shown being finished in walnut stain and varnished. The $\frac{1}{2}$ by $\frac{1}{4}$ -in. strips of aluminum that decorate the outside of the box are polished and attached with small nickel-plated, round-head screws. With the aluminum strips in place, the plastic overlays are glued to the box. These overlays can be of any color to suit the individual taste as a wide range of color is to be had in such laminated plastics. The overlays on the box are $\frac{1}{16}$ in. thick. In the stand shown in the photograph the

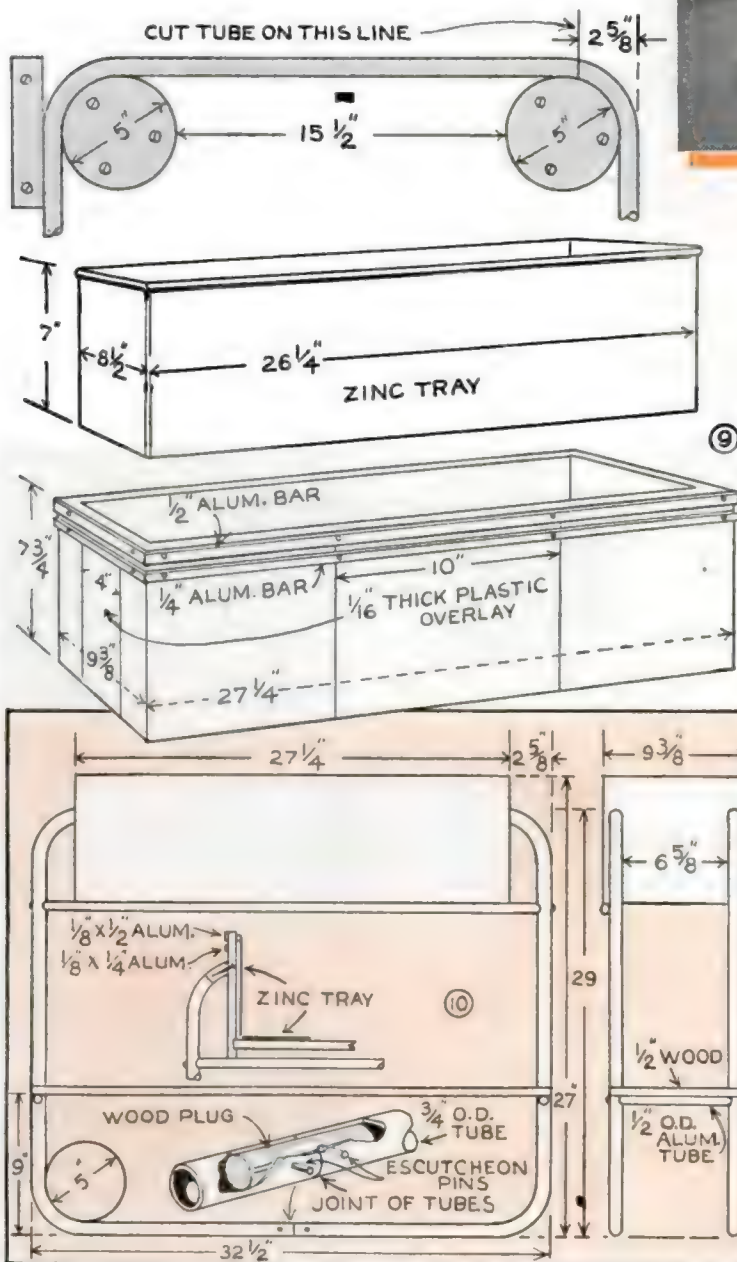
material for overlays was black Bakelite.

The legs are of $\frac{3}{4}$ -in. o.d. aluminum tubing with .065-in. wall. The bending process entails the plugging of the tubes and filling with dry sand

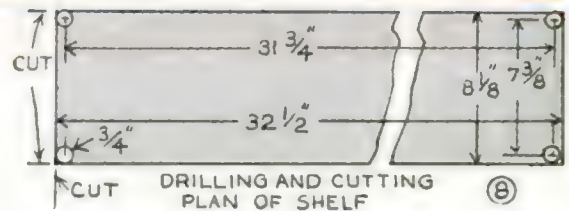


All the metal parts should be buffed carefully and polished before assembly. In this way you will be able to get a uniform finish on parts that become inaccessible as soon as the job is set up

to assure a clean bend, the sand being emptied from the tube on the completion of the bend. The method of bending is shown in Fig. 4. Before bending, however, all metal pieces should be polished on a buffer so that only hand polishing is necessary after assembly. The joining of the legs at the base is accomplished by plugging and pinning as shown in Fig. 10. The ends of the legs which fit against the box are very tightly plugged with hardwood, as it is this plug which holds the screw from the inside of the box and takes most of the strain. The crossbars are of $\frac{1}{2}$ -in. o.d. aluminum tubing having a .049-in. wall, the ends of these being filed out to fit against the legs. Dowel rods $\frac{3}{8}$ in. thick

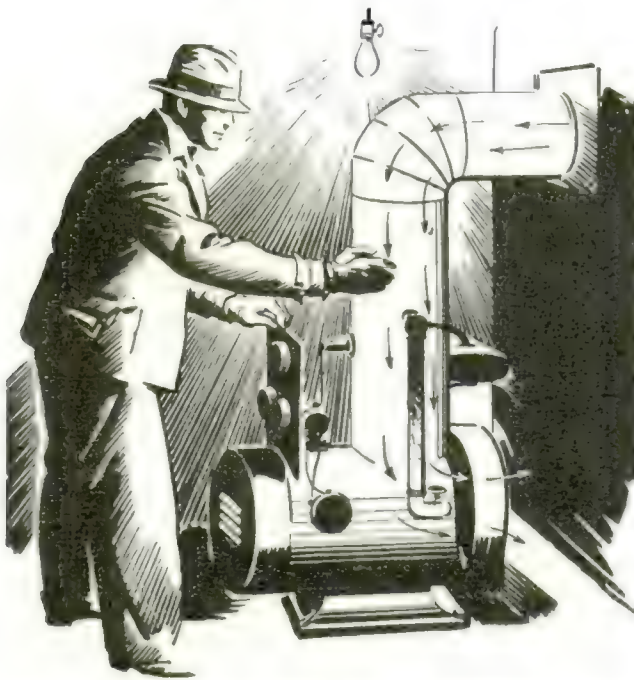


If you're handy at metal working it's no job at all to make the watertight metal tray. It is possible, too, that you could use one taken from an old discarded stand



are inserted into the crossbars to take the screws, the dowel rods being continuous through the length of the tube to tighten up snugly with no chance of coming loose, as might happen in the case of a plug. See Fig. 6. With the legs and crossbars in position, centers are marked and drilled in the box for the screws holding the legs, and the box is fastened in position. Next, the top crossbars are screwed to the underside of the box to avoid slippage. The last step in the building of this stand is the cutting, staining, varnishing and overlaying of the lower shelf. The shelf, of $\frac{1}{2}$ -in. wood, is first cut oversize and $\frac{3}{4}$ -in. holes are drilled at the corners to make a snug fit against the legs. The shelf is then cut to size and finished, and the plastic overlay glued in place. This overlay is of $\frac{1}{32}$ -in. plastic.

Lighting Plant Cooled by Air Piped to Motor

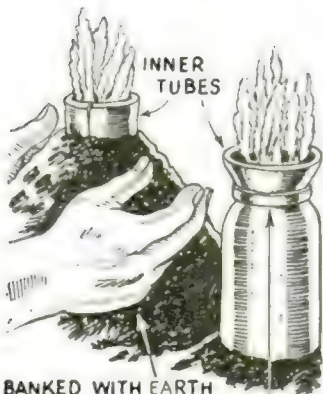


Motors of electric-lighting plants located in poorly ventilated rooms cooled by drawing air from outside

Here's an efficient method of bringing in outside air to cool the motor of an electric-lighting plant of the type having a fan incorporated in the flywheel. The small hood over the head of the motor is lifted off and lengths of stovepipe necessary to reach to a window or other opening in the wall are slipped over the sheet-metal sleeve surrounding the cylinder. The flywheel fan will draw the air down the pipe and around the cylinder.

—G. W. White, Severn Park, Ont., Can.

Celery Encased in Inner Tube Bleaches Uniformly



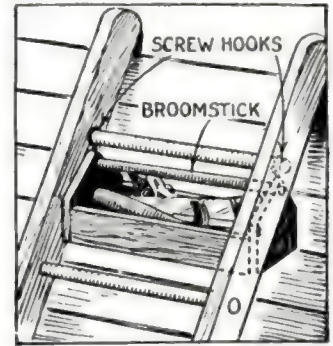
BANKED WITH EARTH OR TIED WITH RUBBER BANDS

For the home gardener who raises a little celery for his own use, the method shown for bleaching it will be found easier and better than the usual one of wrapping each bunch with paper. Lengths of old inner tube are slipped down over the stalks and tied around the top with a rubber band or

banked with dirt. Celery bleached in this way is usually crisp and, as the rubber is unaffected by moisture, the stalks are not stained.—A. H. Waychoff, Tempe, Ariz.

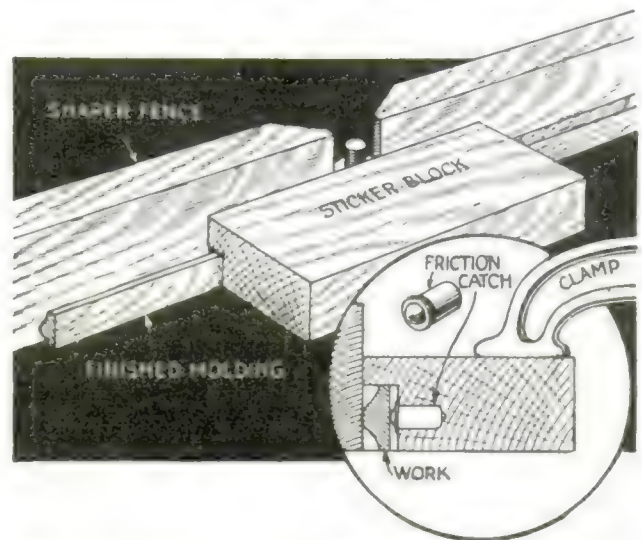
Toolbox Swings on Rungs of Ladder

Besides having a broomstick carrying handle, this toolbox is fitted with two large screw hooks so that it can be hung on the rung of a ladder where small tools will be handy to the worker. As the ends of the toolbox extend above the sides, it always hangs level.



Play in Shaper Sticker Block Avoided by Friction Catch

To prevent play in the sticker block of his shaper, caused by varying thicknesses of stock while running several hundred feet of screen molding, one craftsman fit-



Friction catch in shaper sticker block takes up play caused by slight variation of thickness in stock

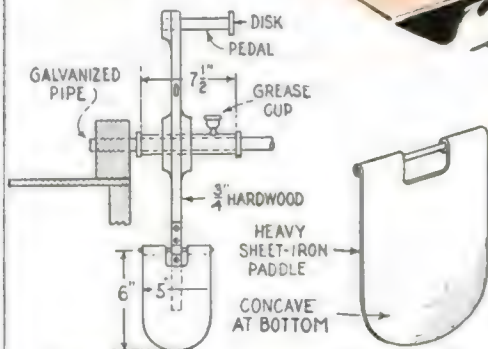
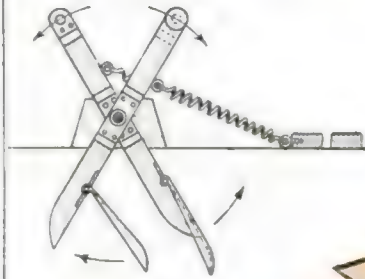
ted a friction catch in the block as shown. This permitted a uniform pressure to be exerted against the molding strips, yet allowed easy passage through the block.

Wayne C. Leckey, Aurora, Ill.

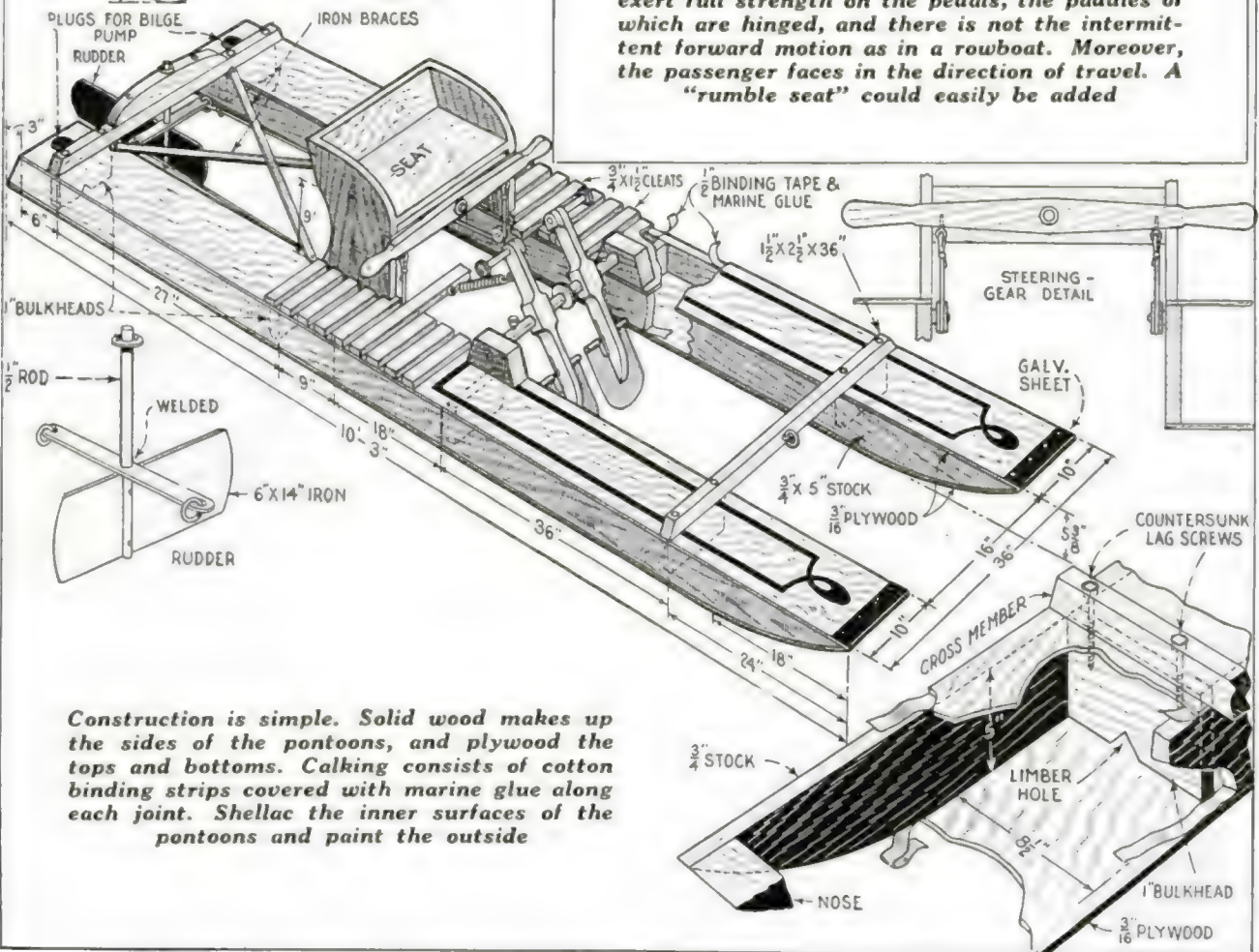
☛ Kerosene lamp burners can be cleaned with wood ashes and water.

"SEA-HIKER"

a foot-powered catamaran



Ideal for the beach concessionaire, or even the individual who is near a lake or river, this novel craft is propelled by means of pedals and is steered by a handlebar attached to the front of the seat. Double pontoon construction makes a non-sinkable and non-capsizable craft which is much lighter than a boat. The passenger can exert full strength on the pedals, the paddles of which are hinged, and there is not the intermittent forward motion as in a rowboat. Moreover, the passenger faces in the direction of travel. A "rumble seat" could easily be added



Construction is simple. Solid wood makes up the sides of the pontoons, and plywood the tops and bottoms. Calking consists of cotton binding strips covered with marine glue along each joint. Shellac the inner surfaces of the pontoons and paint the outside

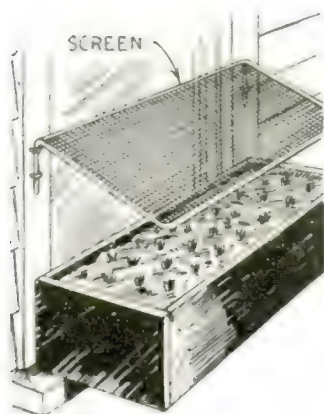
Heavy Barrels Loaded on Truck Easy with Parbuckle



You can roll a heavy barrel into a truck with ease by using a parbuckle

Why strain your body to the limit to load a heavy barrel or other cylindrical object when you can do the job as indicated with much less energy than would be required to roll or lift it into the truck body? Just take a stout rope, double it and place the looped end over an anchor on the truck floor. Then pass the loose ends of the rope under the barrel and roll it up the lowered tailgate or an inclined platform made for the purpose.

Detachable Screen Shelters Plants in Window Box

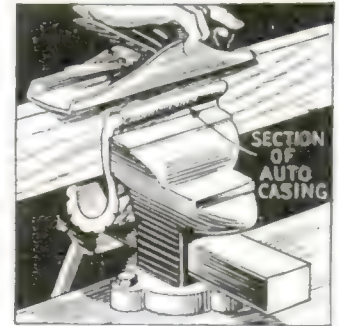


Small flowering plants, when first set out in a window box, need to be protected from beating rains. To do this, fasten a narrow strip of screen wire over a frame of stout wire, which is bent at the ends to fit

into screw eyes driven into the window frame. The screen may be removed after the flowers have grown sufficiently.

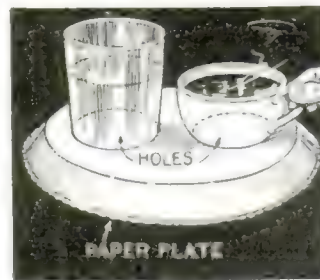
Auto Casing Protects Wood Clamped in Vise

To avoid vise marks on lumber when it is gripped in a small vise for sawing or planing, cut a section of old auto casing with a hack saw and insert it between the vise jaws.



Paper Holds Beverage Cups Safely at Picnic Dinner

The problem of serving cups or tumblers of beverages without danger of spilling the contents on a picnic lunch cloth is solved by cutting holes in the bottom of a paper plate to receive the containers. Cut the holes to take the cups and tumblers snugly and turn the plates upside down before inserting them.

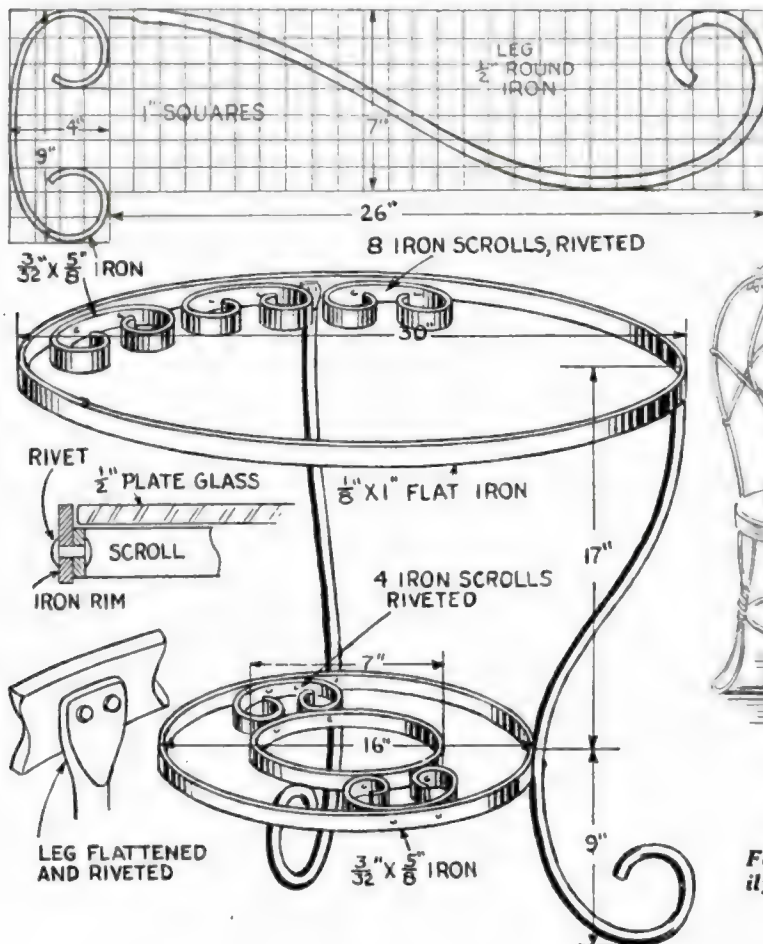


Oilstone Kept in Sliding Shelf Is Handy and Safe

This convenient sliding shelf for your oilstone not only provides a place for safe-keeping, but is always at hand for immediate use. To make the shelf, trace the outline of the stone on a $\frac{3}{4}$ -in. block about 4 in. wide, and cut this out with the coping saw. Then nail a thin strip over the bottom of the opening to hold the stone, and slide the assembly under the bench.



Glass-Top Table of Iron for Porch or Garden



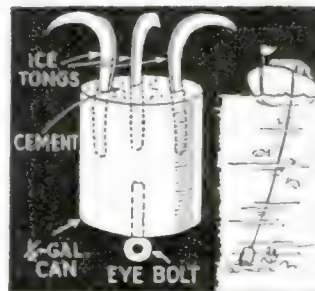
For use indoors or outdoors, this table is easily made as its construction consists of a simple iron-bending job

A striking piece of furniture for use either indoors or outdoors, this glass-top table, with its delicate scrollwork, is an excellent project for the amateur ironworker. Finished in white enamel, it is in keeping with the modern trend in graceful iron furniture. Construction is simple as there are only four curved legs, three iron rings and twelve iron scrolls all riveted together. The rings can be lapped at the joints and riveted, although lap-welded joints will look better. The legs should be made of $\frac{1}{2}$ -in. iron rods bent as shown in the squared detail, with the upper ends flattened and riveted to the table-top rim. The scrolls are of lighter iron than the rim, and support the glass top, which fits just inside, and flush with the rim. About $\frac{1}{8}$ in. clearance should be allowed between the rim and glass so that contraction of the latter in cold weather will not cause it to bind and crack.

☛ Transparent photographs can be made by printing negatives on sensitized Cellophane.

A Homemade Boat Anchor

Cast in a $\frac{1}{2}$ -gal. pail, this boat anchor is made of cement and iron prongs, the latter being taken from old ice tongs or shaped from flat iron. First prepare the pail by inserting a large eye bolt through a hole drilled in the bottom. It is best to drive a large nut part way on the thread-



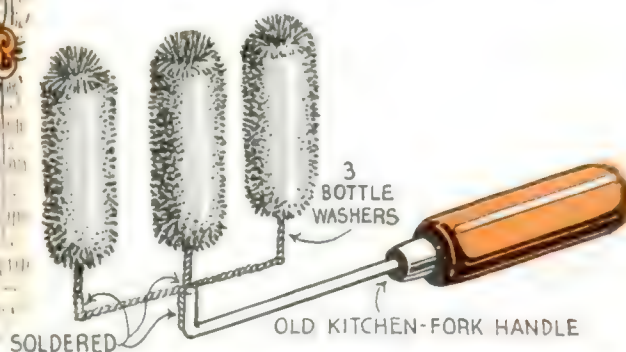
ed end of the bolt to be imbedded in the cement. Then fill the pail with a rich mixture of cement and sand. When this has been done, insert the prongs, spacing them evenly and setting them

an inch or two away from the sides of the pail. It is best to bend the upper ends of the prongs at right angles before inserting them into the cement so that they will not come out under heavy strain.

—Bob Poulson, Los Angeles, Calif.

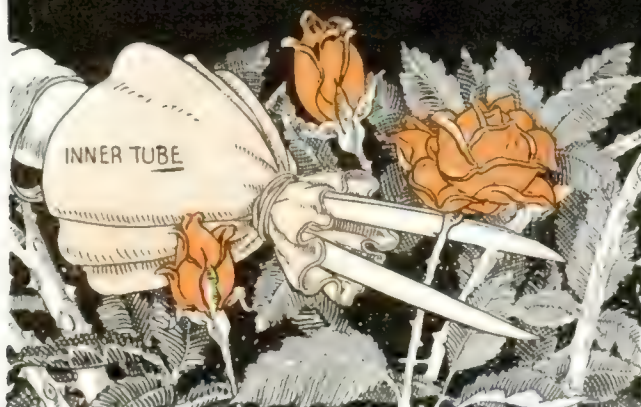


Venetian-blind cleaning is easy with this brush. It consists of three bottle brushes assembled and soldered to a handle. An opening in your porch floor to take the drop shelf in the detail will keep early-delivered milk cool and away from dogs

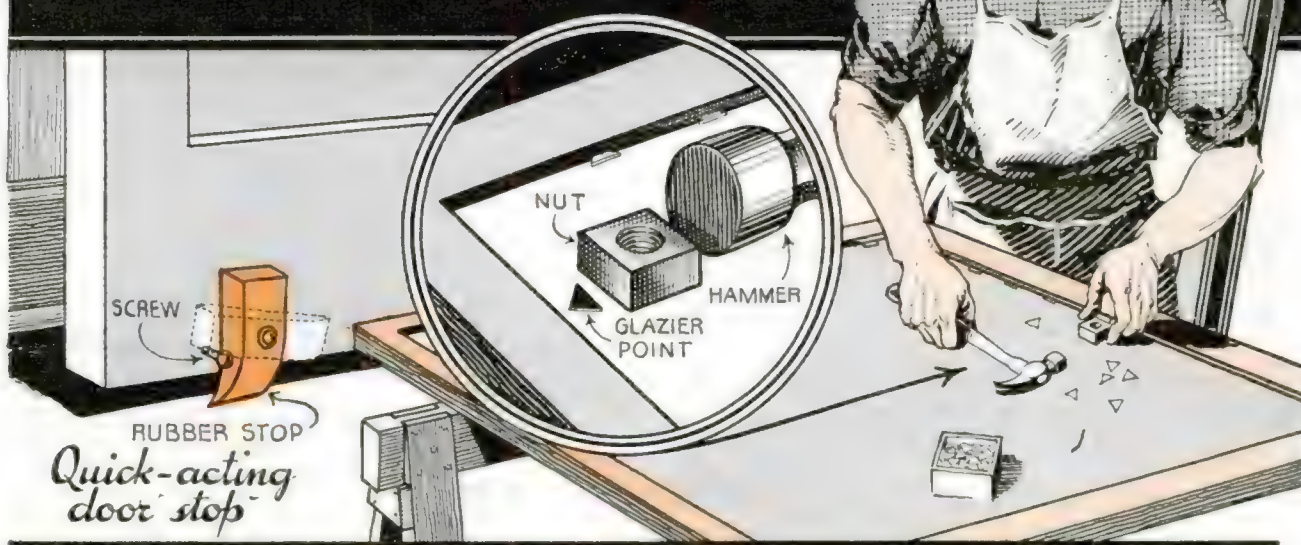


Solving Your

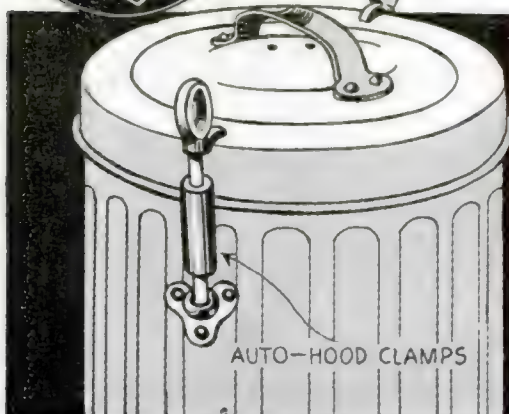
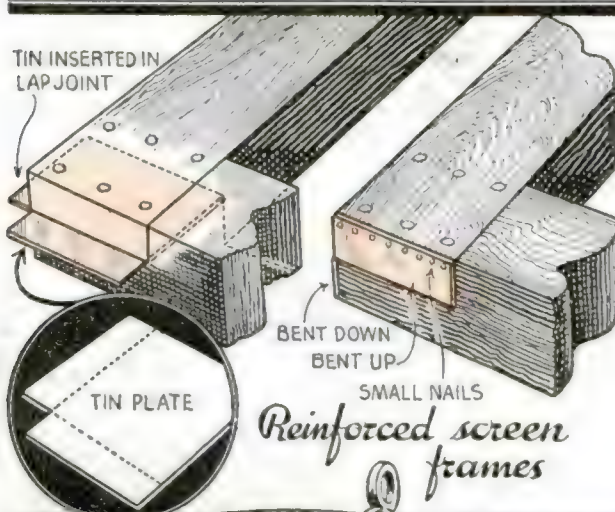
Rugs and other heavy articles are readily kept on a line with large clothespins like the one at the right. It is nothing more than a short length of bamboo slotted at one end. Your old automatic pencil will make a dandy pastry gun for "writing" on cakes with frosting. Just remove the mechanism from inside the pencil and provide it with a clean brass-rod plunger, or even a length of highly polished hardwood dowel. Next time you cut roses or other thorny flowers, tie a length of inner tube over the handles of the scissors as a hand shield.



To aid in driving glaziers' points, a square nut is placed on the glass with the flat side down. You can "point" a sash in a fraction of the usual time, and the points are driven uniformly, which is necessary for a good glazing job. At the left you have an improvement on the action of a door-stop. A rubber wedge is fastened to the door with a screw and another screw, driven only part way, acts as a stop when the wedge is tilted upward to clear the floor.

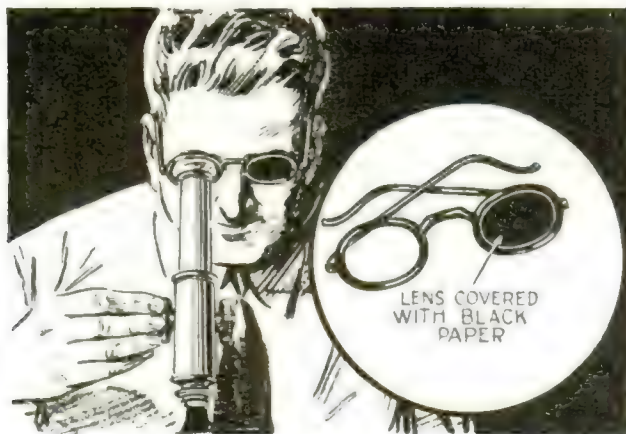


HOME PROBLEMS



Readily adjusted to three positions, the hinged mirror above is a handy addition to the mirrorless dressing table, and it looks well when finished to match the furniture on which it sets. Screen frames are made exceptionally rigid when tin splines are used in the half-lapped corner joints. The splines are shaped as shown in the circular inset, and the projecting edges are bent in opposite directions. The problem of keeping a lid on a garbage can is solved by riveting two auto-hood clamps to the sides of the can as indicated at the left.

Black Disk over Eyeglasses to Use Microscope



Paper disk covering one side of eyeglass frame enables user of microscope to keep both eyes open

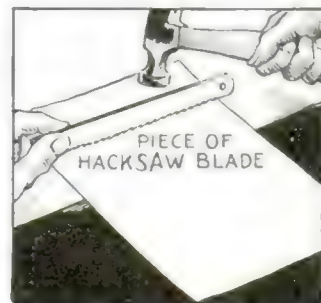
Persons who find it tiresome to keep one eye closed when working with a microscope for a long period of time, will find that a disk of black paper covering one

lens of their glasses will enable them to keep both eyes open. If the microscopist does not wear eyeglasses, the lenses can be removed from a cheap pair of sun glasses and the paper disk cemented over one of the frame openings.

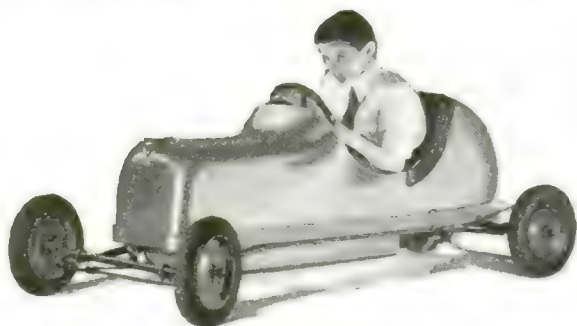
Emergency Paper Perforator

A hacksaw blade with sixteen to eighteen teeth per inch makes an excellent perforator for small home work. Place the teeth along a line laid out for the perforation and

tap the back of the blade sharply several times. This should be done on a very easily penetrated surface, such as linoleum.



Plenty of Fun at a Safe Speed



MORE BLUEPRINTS ON GOOD SUMMER PROJECTS

"ROAMER"—765 to 770: Outboard cabin cruiser. 16 ft. long, 66 in. beam. Requires outboard motor of 20 to 36 hp. Set of six prints \$1.00.

12-FT. ROWBOAT—707: Flat bottom. Can be used with small outboard motor. 25c.

"ZIP," MODEL RACING YACHT—880 to 883: 50 in. long. Four prints \$1.00.

TRELLIS SUGGESTIONS—639: Six types that will help beautify your home. 25c.

LAWN CHAIR—529: Plain sawed from $\frac{3}{4}$ -in. stock. Easily made with hand tools. 25c.

ORNAMENTAL WOOD FENCES—640: Five artistic designs for standard wood stock. 25c.

VENETIAN BLINDS—926 and 927: Three different styles covered on two prints. 50c.

This small car, having a 58-in. wheelbase and 28-in. tread, is very easy to operate and may be powered by a $\frac{1}{2}$ to $\frac{3}{4}$ -hp. gas engine of the washing-machine type. It is equipped with effective brakes and pneumatic tires. Plans show three alternate methods of body construction. Easy to build. Our blueprints Nos. 906 to 909 incl. give you all the information necessary. This set will be sent postpaid on receipt of \$1.00.



LAWN AND GARDEN FURNITURE—920 to 922: Collection of designs for arbor-and-seat combinations and swings. (3 prints.) 75c.

METAL WEATHER VANES—520: Scroll-sawed from sheet aluminum. Complete assembly details. 25c.

Any six of these blueprints will be sent postpaid upon receipt of \$1.00

Blueprint Department, Popular Mechanics Magazine, 200 E. Ontario St., Chicago



BETTER PHOTOS

with diffused light

Dime-store aluminum ware and music stands used to make these photo lamps

BUILT at a cost of about three dollars each, these two photo lamps will help you in getting good portraits and close-ups on "still" subjects, shot indoors. The lamp in Fig. 1 is the diffusing type, designed especially to light the face of the subject, while the lamp shown in Fig. 2 gives indirect illumination free from "hard spots" and "rings." When completed, each lamp is mounted on a folding music stand to which an extra length is added.

In assembling the diffusing type of lamp you get an aluminum drinking cup $3\frac{1}{2}$ in. in diameter and 3 in. deep; a hot-cake cover, $6\frac{1}{2}$ in. in diameter and $2\frac{3}{8}$ in. deep; a metal embroidery hoop 7 in. in diameter; a telescoping curtain rod of which the solid rod is about $\frac{3}{16}$ in. in diameter, and a porcelain socket. The method of assembly is shown in Fig. 3. Set the hot-cake cover on a smooth wood surface, find the exact center of the inside bottom and scribe a circle

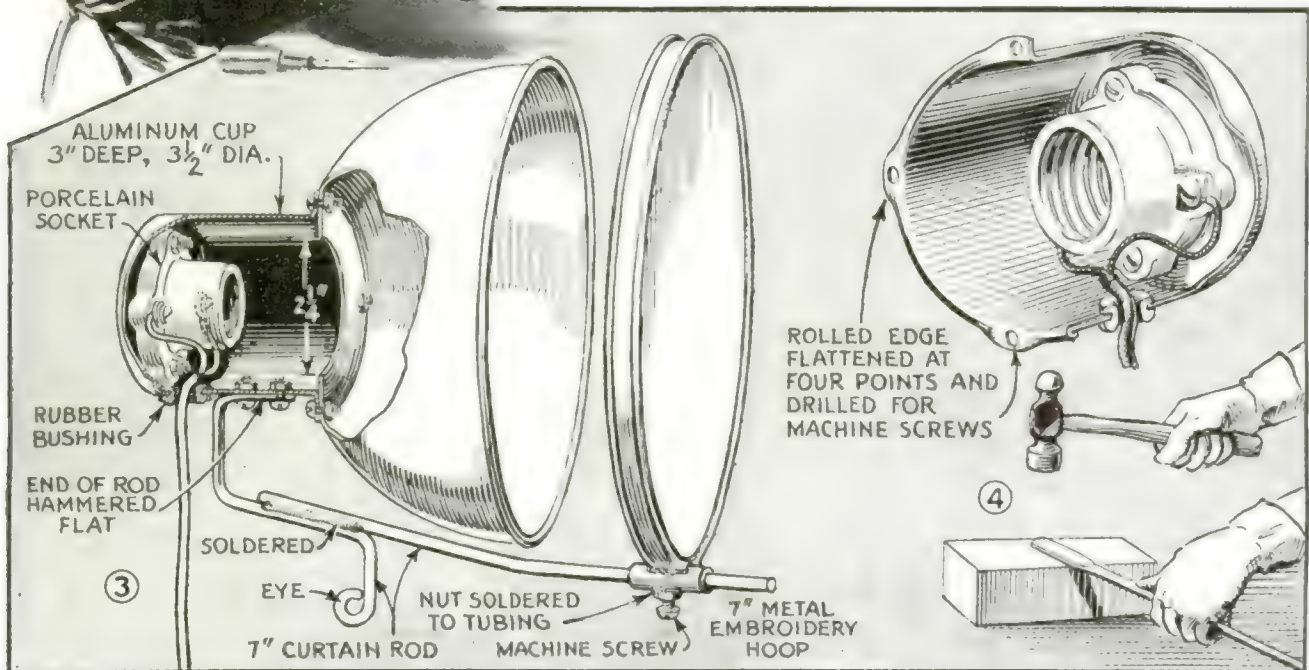


A diffusing screen or indirect light





and connect it to the socket, and attach the socket inside the cup. Hold the cup against the reflector and screw a No. 1 photoflood lamp into the socket, moving the cup until the lamp is located in the exact center of the hole in the reflector. Then mark the positions for the four screws, drill the holes and fasten the cup on permanently. The supporting arm to hold the diffusing screen is flattened at one end as in Fig. 4. Of the two holes that remain from the cup handle, the one nearest the top of the cup may be used in mounting the supporting arm. Then only one hole need be drilled in the cup for the arm. The other end of the arm is bent to form an eye for attachment to the lamp standard, and another length of curtain

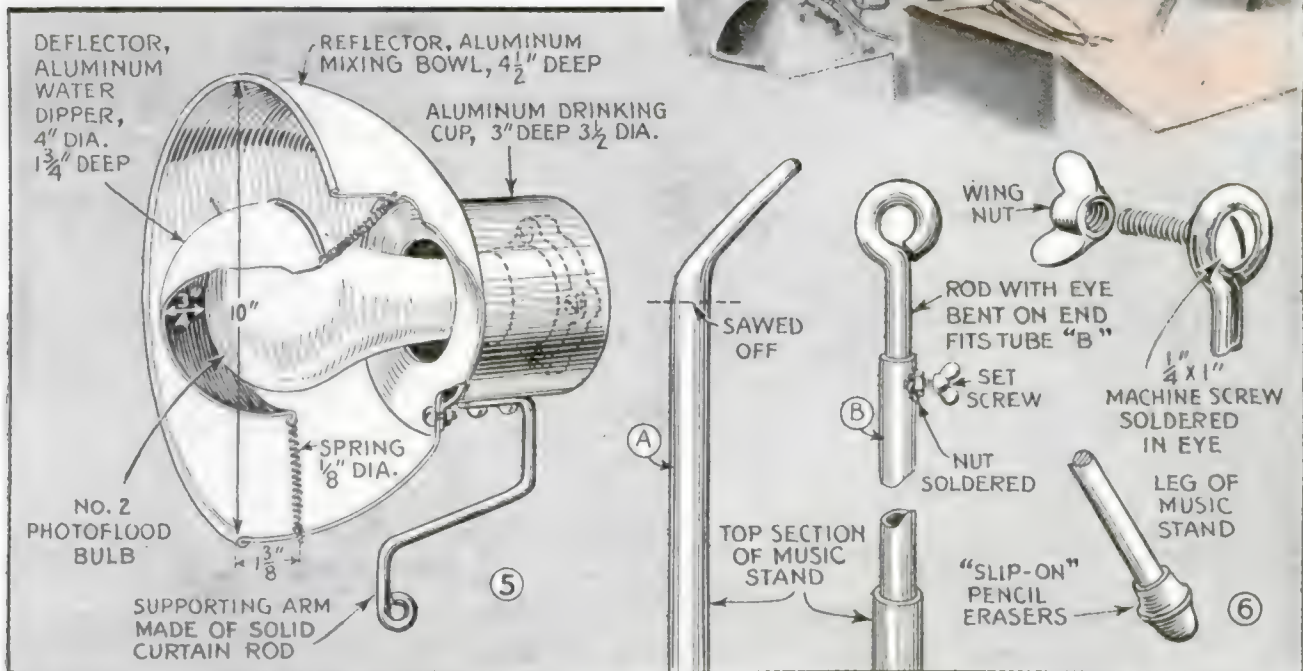


2 $\frac{1}{4}$ in. in diameter. Cut this out with a hammer and a narrow chisel, after which you smooth up the ragged edge. Now remove the handle of the drinking cup by drilling out the rivets. In line with the holes remaining from the cup handle, drill a $\frac{1}{4}$ -in. hole about $\frac{5}{8}$ in. from the bottom of the cup and ream the hole to take a rubber "doughnut" bushing. Next, set the cup, bottom down, on a smooth surface and place the flat-base porcelain socket in the exact center. Mark the positions for the machine screws to hold it, and drill the holes. Then stand the cup, bottom up, on a smooth surface and flatten the rolled edge at four places for $\frac{1}{16}$ -in. screw holes. Pass the light cord through the insulator

rod is soldered onto the supporting arm to hold the diffusing screen. The outer frame of the embroidery hoop is soldered to a 1-in. length of tubing, which is drilled and has a nut soldered on to take a screw for tightening.

The indirect lamp shown in Figs. 2 and 5 is of similar construction in that the same size of drinking cup is used to house the socket. But the reflector is a 10-in. mixing bowl and a deflector is suspended inside by means of three small coil springs. Also, a No. 2 photoflood lamp is used. A 1 $\frac{1}{2}$ -in. circle is cut in the bottom of the bowl after which you attach the cup, which holds the socket. The supporting arm is made and attached and then the de-

flector is mounted. This is a 4-in. water dipper from which the handle has been removed. The rolled edge is divided into three equal portions, marked with a pencil and flattened at the rim for holes to which the springs are attached. These are $\frac{1}{8}$ in. in diameter and 2 in. long. Next, the rolled edge of the bowl is divided into three equal portions and marked with a pencil. To find the positions for the screw eyes, you measure $1\frac{3}{8}$ in. into the bowl. Very small holes are punched so that the screw eyes can be driven through the shell of the bowl. The ends of the springs are fastened to the eyes. Be sure to close the loops in the springs so they will not pull off. As there are variations in porcelain sockets, some will project the lamp farther



into the bowl than others. This will have to be taken into consideration before fastening the screw eyes into the bowl as the deflector should be spaced about $\frac{3}{4}$ in. from the lamp.

Folding music stands make good standards for these lamps. The only alteration necessary is at the top of the standard. The bent portion designed to fit the rack is cut off as indicated in detail A of Fig. 6. Then a hole is drilled near the top of part A and a nut is soldered over the hole to take a thumbscrew, which is made by soldering half of a washer in the slot of a machine screw. This detail is shown incorrectly as being attached to the curtain-rod sleeve B. The sleeve is pushed inside

of the top section of the music stand, the rolled end of the sleeve keeping it from sliding down too far. The thumbscrew forces the sleeve tightly against the solid rod inside of it after the latter has been pulled out to the desired height. The upper end of the rod is bent to form an eye into which a $\frac{1}{4}$ -in. brass machine screw is soldered, this fitting the eye on the lamp supporting arm. A wing nut holds the two securely together after the lamp has been adjusted to the angle desired. It is also a good idea to provide the feet of the music stand with pencil erasers of the slip-on type, in order to prevent marring varnished floors and also to make the light stand firmly where it is placed.

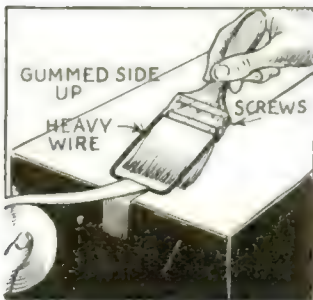
Driving Small Rods with Weight to Avoid Buckling



Driving iron rods into ground with weight on ends prevents vibration which causes buckling

Electric-light line repairmen and telephone or radio servicemen, who have experienced difficulty by having small ground rods buckle when driving them, can profit by the method used by workmen of one electric-power company. These workmen found that the buckling was caused by vibration set up in the rods when struck with the driving sledge, and the trouble was eliminated by using a weight on the ends of the rods when driving them. The weight was merely a piece of iron or steel shafting drilled part way through to slip over the ends of the rods.

Gummed-Paper Tape Applied with Paintbrush



When gummed paper tape is employed in sealing large paper cartons, the long strips torn from the moistener usually become too dry to adhere firmly before they are smoothed in place. To eliminate this possibility, bend a length of heavy wire to

a U-shape and screw it to the sides of a discarded paintbrush. Strips of tape are removed from the roll without moistening and applied to the cartons in the following manner: First dip the brush in water to moisten the bristles. Then, insert the tape through the wire guard, gum side up, and draw the brush along the surface to be sealed so that the brush moistens the carton and the wire guard pulls the tape in place.

Warning Flag Carried in Pocket

When working on road construction projects, where a warning flag is often needed, a workman carries it in his pocket. The flag is hemmed at the wide edge so that it can be slipped over the handle of a pick or sledge and displayed in the manner indicated.



Large Wheel of Threshing Engine Forms Good Watering Tank

Finding a 6-ft. wheel from a steam threshing engine in a junk pile, an Iowa farmer converted it into a stock-watering tank, which will last for years. The hub and spokes were removed from the wheel,



This old threshing-engine wheel has solved an Iowa farmer's watering-tank problem for years to come

after which the rim was laid on a strong, reinforced foundation of concrete. Then a rich mixture of cement and sand was applied to the foundation surface, both inside and outside the rim to a depth of 2 or 3 in., to make a watertight bottom for the tank.—R. F. Fryklund, Audubon, Iowa.

Worker Wears Towel on Arm

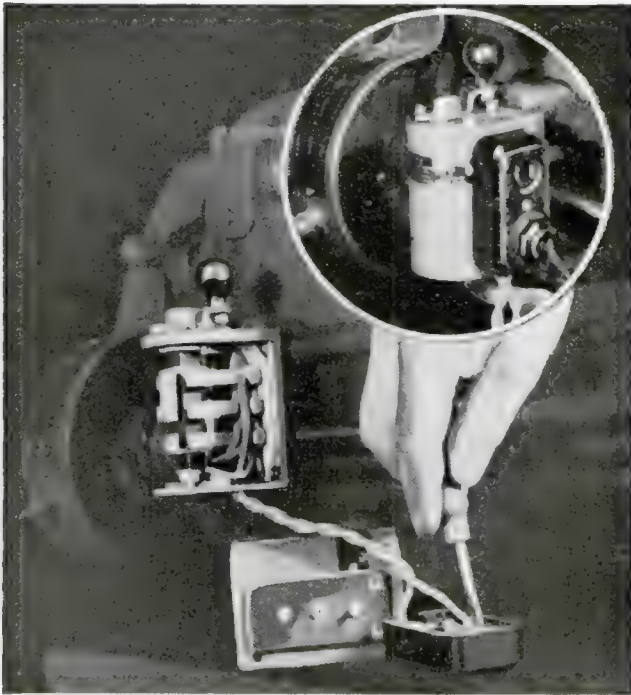


In shops and factories where workers must handle materials which keep their hands soiled, the problem of wiping perspiration from their faces on hot days is solved by

wearing towels on their arms. The towels are sewed up in the form of sleeves, which are large enough to slip over the hands.

Electrical Outlet on Lathe Is Handy for Attachments

If you have a metal-working lathe that has a forward-reverse switch with the line current carried directly to it, it's an easy matter to attach an electrical outlet at this point for plugging in an extra light, tool-post grinder, mica undercutter, etc. The outlet is of the double type used in house wiring, and is attached to the out-



An integral part of the lathe, this outlet is handy for attaching an extra light, tool-post grinder, etc.

side of the switch housing with small stove bolts. If possible, put the bolt heads inside the housing. Run the wires down the side of the switch and up through the extra wiring hole in the bottom of the housing.

Special Nozzle to Clean Drums in a Factory



Homemade nozzle directs hot water inside of drums to clean them quickly

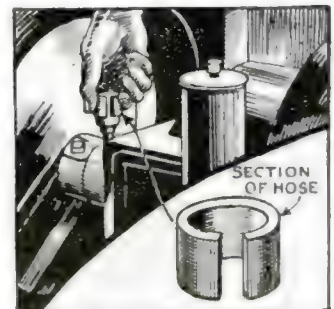
In one factory where there were a number of drums to clean every day, the job was done quickly with the aid of steam, hot water and this simple nozzle. The nozzle is merely a length of pipe with a cap having several small holes drilled in it. The nozzle is attached to the hot-water line with a length of hose.

—A. H. Waychoff, Tempe, Ariz.

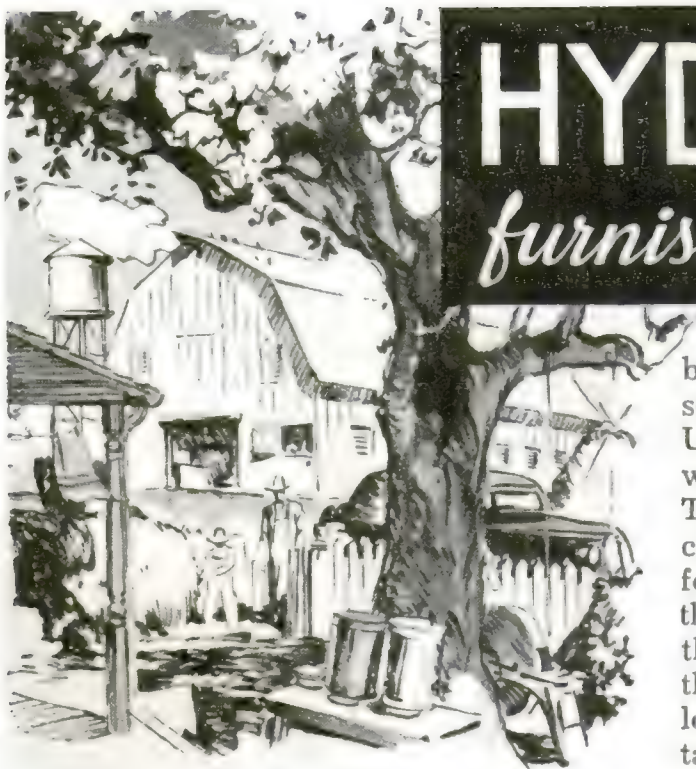
Grease-Cup "Wrench" Is Made from Rubber Hose

A short section of rubber hose, split at one side, may be carried easily in one's pocket for turning grease cups on any machine. The rubber not only gives a firmer grip

for twisting the cup but also protects the fingers when a cup is so located that it may be too hot to turn with bare hands.



☐ Pieces of Cellophane cloth of the basket-weave pattern hung over photo lights make good diffusing screens.



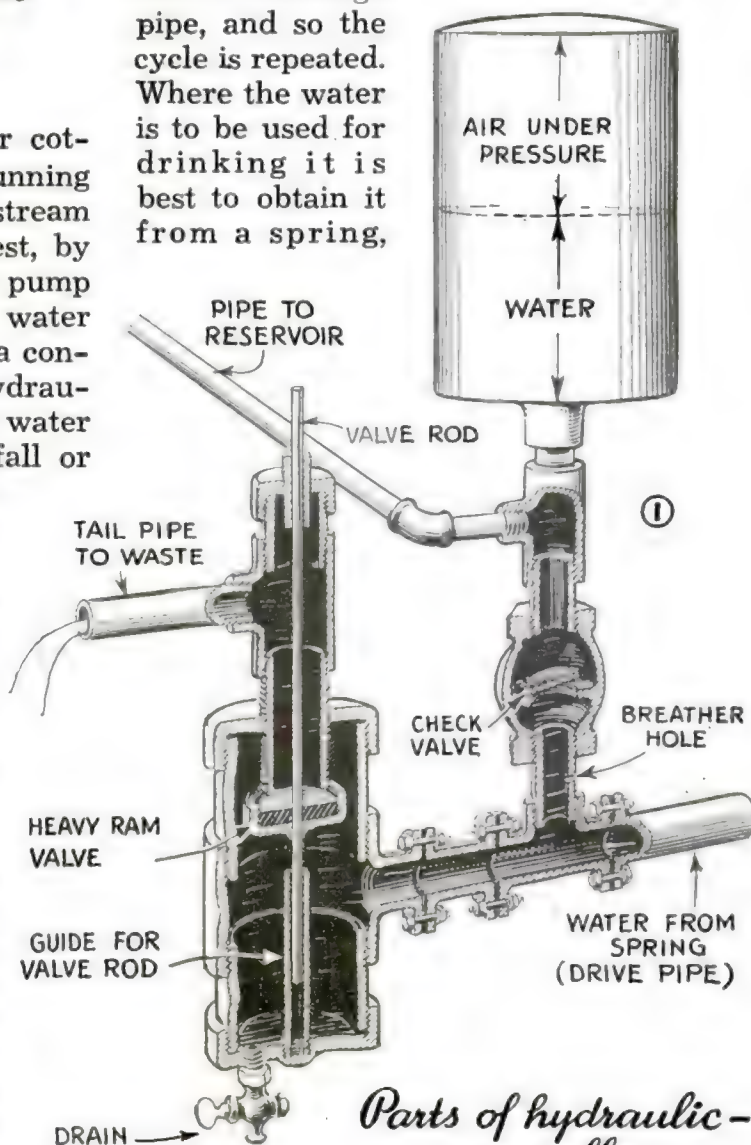
HYDRAULIC

furnish water supply

PART I

MANY rural homes and summer cottages can be furnished with running water from a near-by spring or stream even though its daily flow is modest, by installing a hydraulic ram. This is a pump which takes advantage of a small water fall to lift a portion of the water to a considerable height. Theoretically, a hydraulic ram should lift one-half of the water available twice the height of the fall or $\frac{1}{20}$ of it twenty times the height of the fall. But the actual efficiency of rams is less and varies considerably. Fig. 1 shows the working parts. Under normal conditions, the ram valve is open, thus allowing water to flow through the ram. As water flows, its velocity increases until the valve is lifted and quickly closed. Since water in motion possesses energy, a considerable pressure is developed. This pressure opens the check valve, thus admitting a quantity of water to the pressure chamber. When enough water has entered to relieve the excess pressure, the check valve automatically closes, thus preventing water from flowing back. At this instant a small volume of air enters through the

breather hole to replenish the air dissolved and carried away by the water. Upon the next stroke of the ram this air will be forced into the pressure chamber. The addition of water to the pressure chamber compresses the air which in turn forces water through the delivery pipe to the reservoir. When the check valve closes, the weight of the ram valve overcomes the pressure against it and drops, thus allowing water to again flow through the tail or discharge pipe, and so the cycle is repeated. Where the water is to be used for drinking it is best to obtain it from a spring,



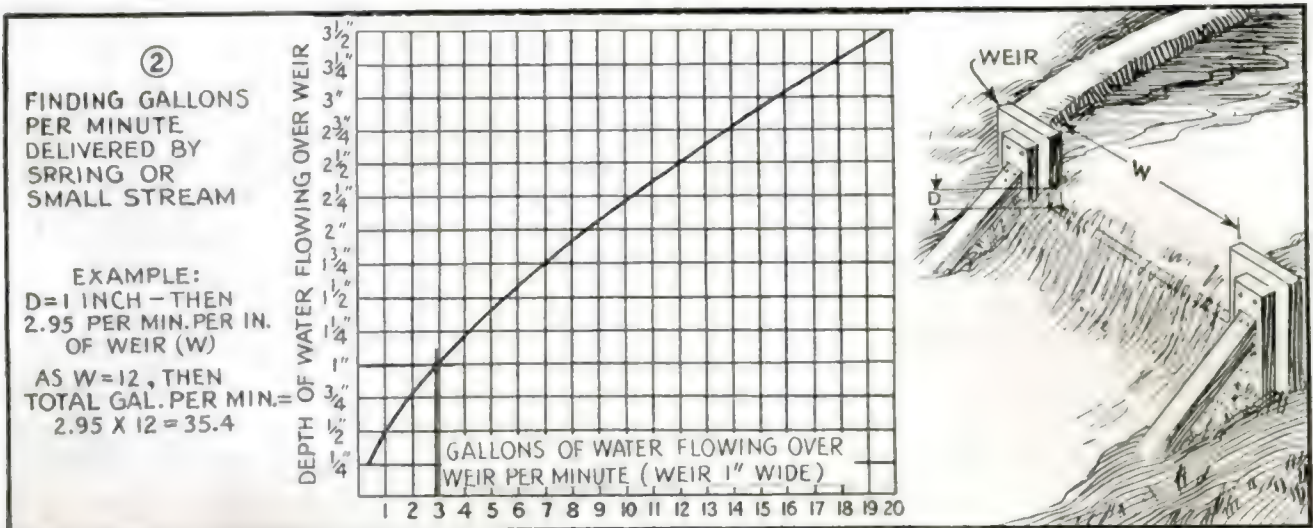
Parts of hydraulic-ram installation

RAMS

to country homes

but if it is to be used for washing, stock watering and other purposes, the supply can be obtained from a small stream.

We shall first explain simplified methods which will enable anyone to determine how much water can be lifted from a spring to the location where it is to be used, and then illustrate methods of surveying the spring and determining the other necessary values.

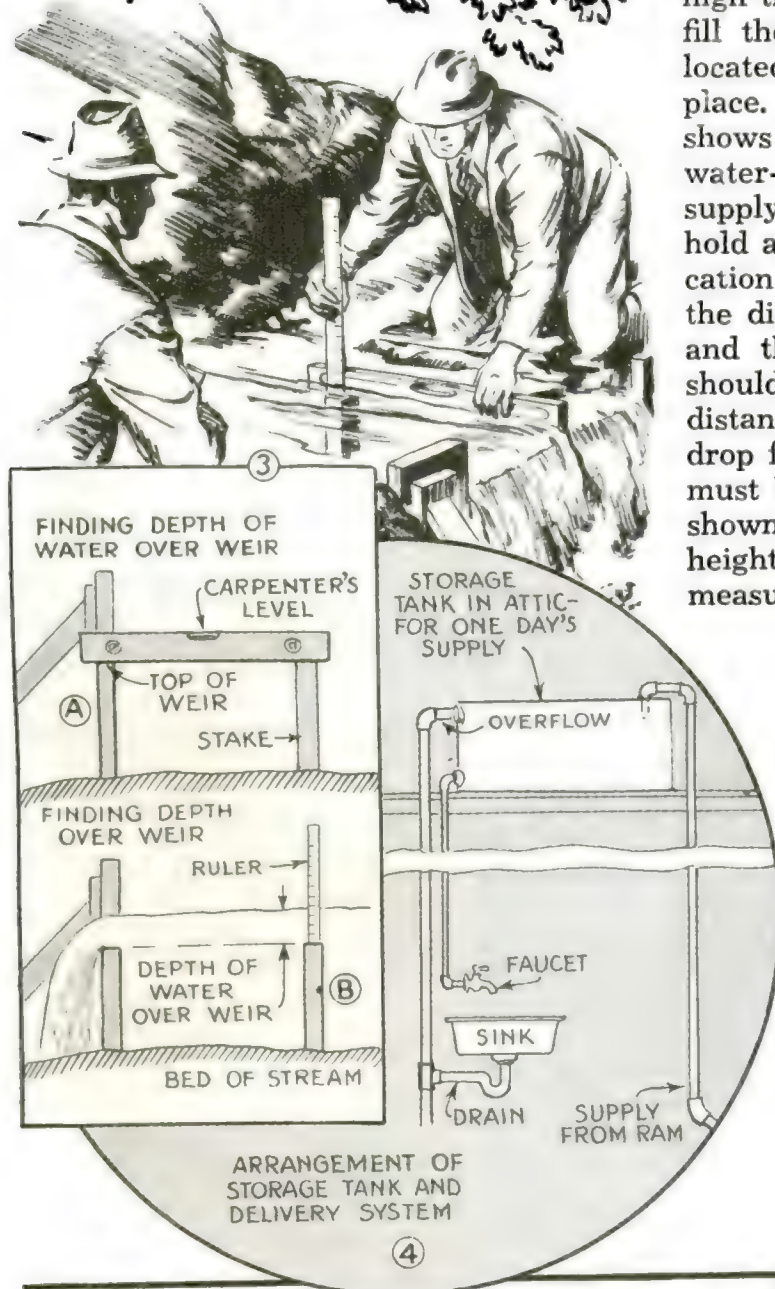


First measure distance D, which is the depth of water flowing over the weir, by the method shown in Fig. 3. Locate this value at the left-hand side of the chart, follow across to the curve, and then drop down where the amount of water in gallons per minute for each inch of weir length is given. Multiplying this number by the length of the weir in inches gives the total amount of water passing over the weir per minute

The spring must be surveyed first to find whether it will deliver enough water. To do this it is dammed as shown in Fig. 2, so that all of the water flows over the edge of the board or "weir." The weir must be perfectly level and so arranged that no water can flow under or around it. The flow should be slow and free from turbulence. The depth of the water flowing over it is measured as shown in Fig. 3. First drive a stake a couple of feet above the weir, the top of both stake and weir being level, which can be determined by the method shown in detail A. Then the

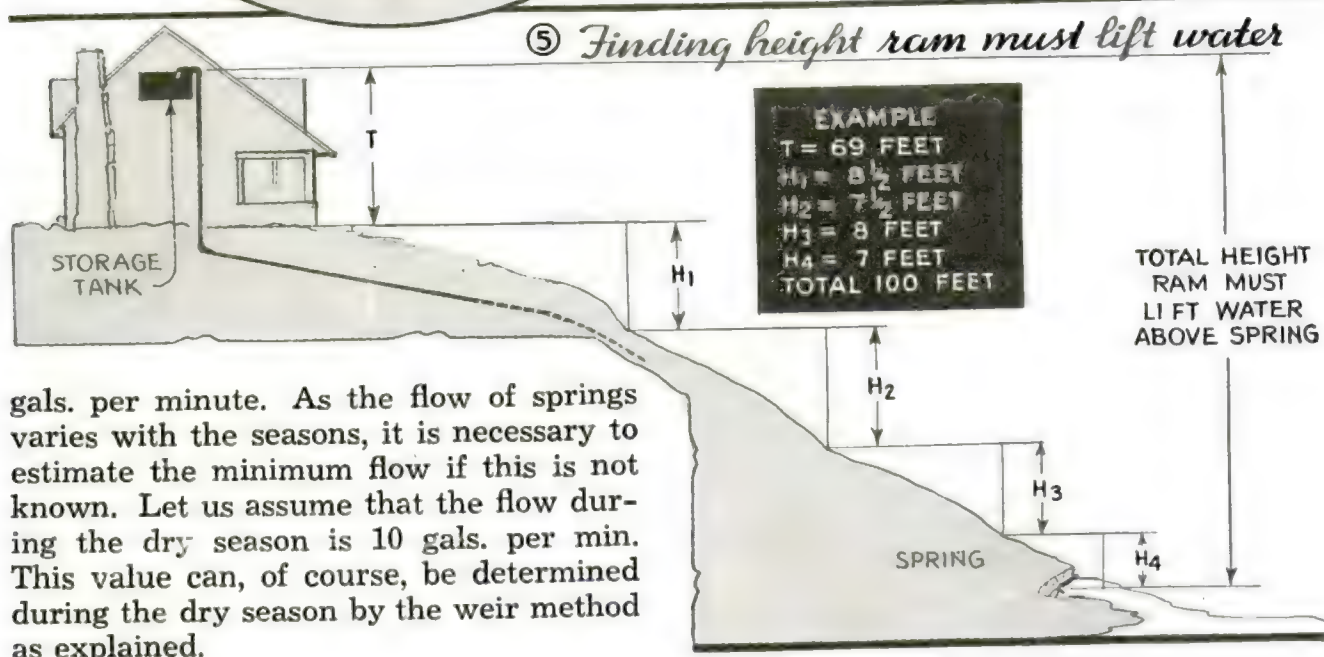
distance from the top of the stake to the surface of the water is measured as in detail B. We can now determine the amount of water in number of gals. per min., by referring to Fig. 2. To illustrate the method we will assume that the depth of water flowing over the weir is one inch. We locate one inch on the left-hand side, following across to where this line meets the curve, and drop down to read a trifle below 3, say 2.95, as the gals. per min. for each inch of weir. Next we multiply this by the length of the weir which we will assume to be 25 in., giving a total of 73.75

Finding depth of water over weir

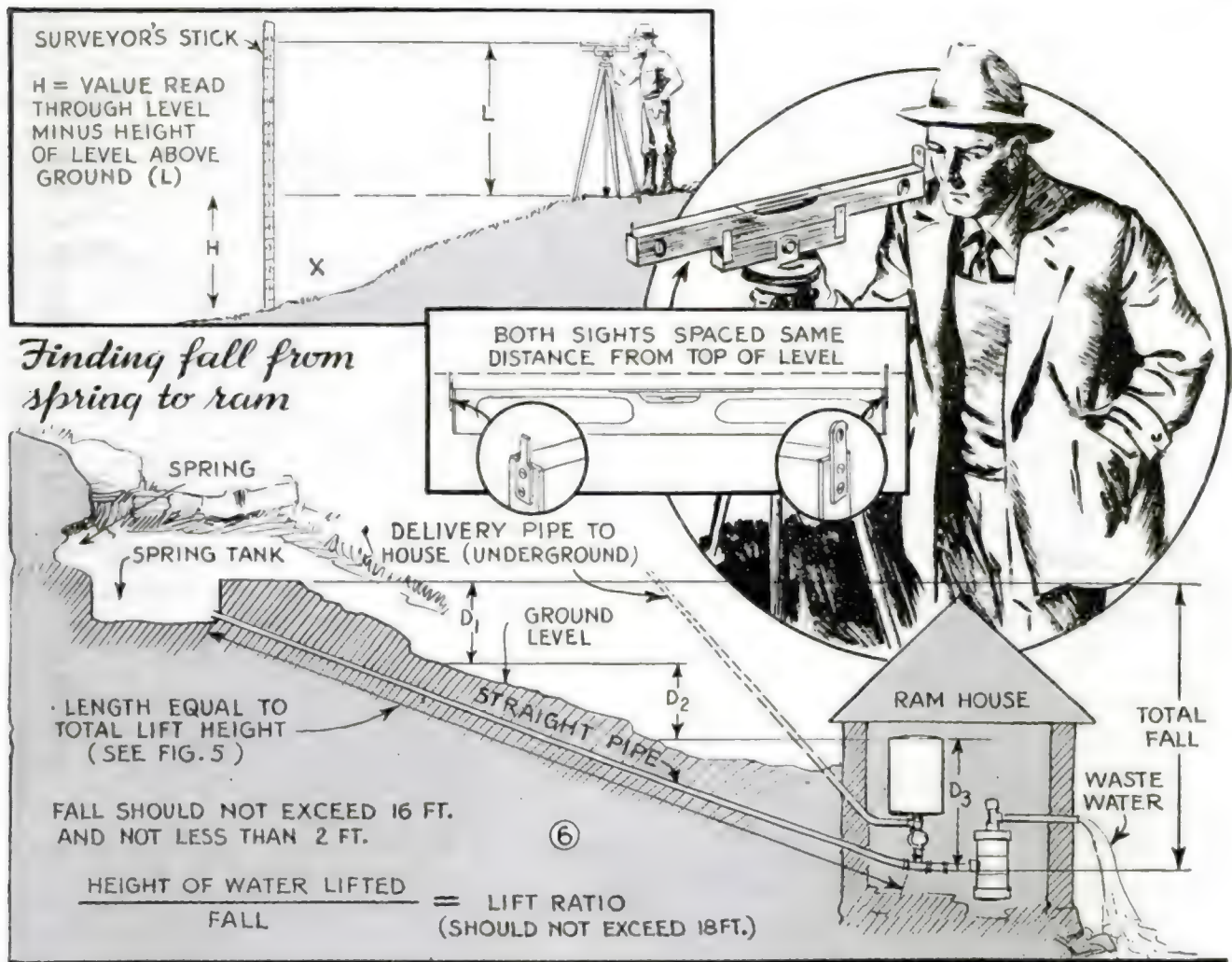


Next, it is necessary to determine how high the ram will have to pump water to fill the supply reservoir, which may be located in the attic or other convenient place. Some use an outside tank. Fig. 4 shows a practical arrangement for the water-supply system. The reservoir or supply tank should be large enough to hold an entire day's supply. With the location of the reservoir tank determined, the distance between the top of the tank and the ground level beside the house should be measured. This is indicated by distance T in Fig. 5. Then the vertical drop from the ground level to the spring must be measured in a series of steps as shown in Fig. 5, in order to determine the height that the water must be raised. The measurements of vertical drop are made

with the use of a surveyor's level and stick. If a surveyor's level is not available you can improvise something that will work with reasonable accuracy from a carpenter's level fitted with sights so that the line of sight will be parallel to the top of the level. For the stick you can use a long pole graduated with numbered markings spaced 6 in. apart. The upper detail of Fig. 6 illustrates how level and stick are used, the level being mounted on a suitable tripod which is fitted with a plumb bob. Set the stick at location X and after adjusting the level sight



gals. per minute. As the flow of springs varies with the seasons, it is necessary to estimate the minimum flow if this is not known. Let us assume that the flow during the dry season is 10 gals. per min. This value can, of course, be determined during the dry season by the weir method as explained.

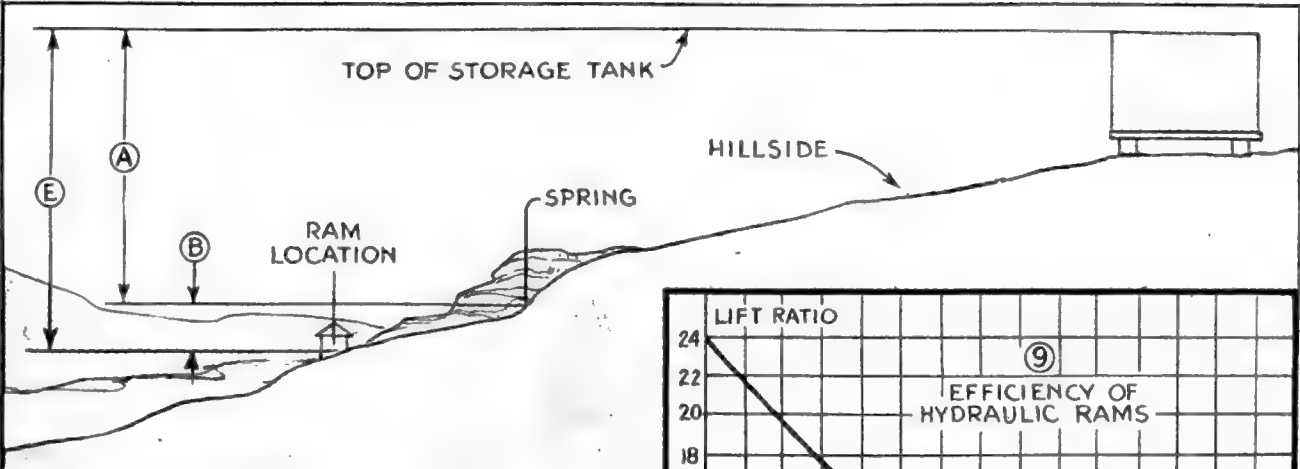


Besides measuring the vertical drop from the top of the reservoir tank to the spring, the additional drop from the spring to the ram, located not over 16 ft. below the spring, should be measured in the same way, using the level system shown in the upper details

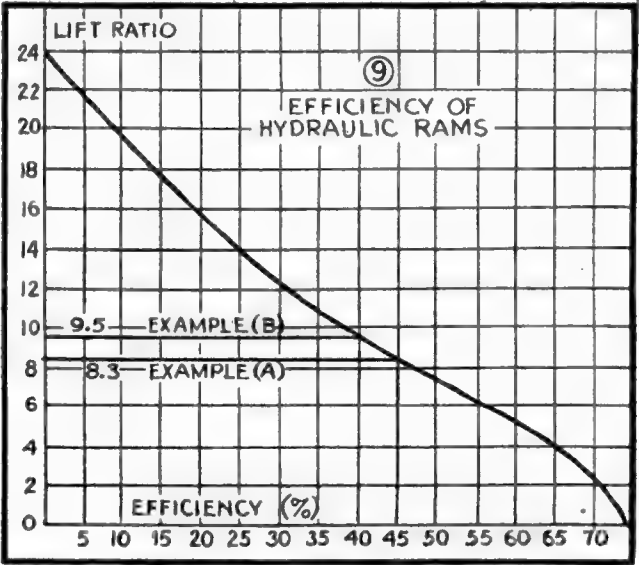
over it, noting the height where the line of sight crosses the stick. From this height you subtract L , which is the distance from the level to the ground, and the remainder is distance H . Then set the level with the plumb bob at point X and repeat the process. In this way distances H_1 , H_2 , H_3 and H_4 of Fig. 5 are measured. Adding all of these to distance T gives the height that water must be lifted from the spring to the top of the tank. It is not necessary that the path taken between the house and the spring be straight.

It must then be determined how great a fall of water is available for operating the ram. To do this, locate a point below the level of the spring from which the waste water from the ram can easily drain away. The straight pipe-line distance between the spring and the ram should be about the same as the vertical height to which the ram must lift the water. To continue with the example, we will assume that the top of the supply tank was found

to be 100 ft. from the spring. This means that a pipe at least 100 ft. long will have to be run from the spring, straight but sloping downward, to a place below the spring where the ram will be located. Having determined the ram location, which should not be less than 2 ft. nor more than about 16 ft. below spring level and 100 ft. or more from the spring as shown in Fig. 6, we are ready to find the fall or head available for pumping water. This is the vertical height of the spring above the ram location and is found with a surveyor's level and stick as previously explained. We will assume our survey shows that the total fall (Fig. 6.) is 14 ft. Then from Fig. 7 it is easy to determine whether a spring will pump as much water as is required. Assuming that the ram will be located 14 ft. vertically below the spring, Fig. 6, we deduct 2 ft. to allow for frictional loss in the drive pipe. This leaves 12 ft. as the fall available for pumping water. We will also assume that the requirements are 550



⑦ FINDING SPRING FLOW REQUIRED TO OPERATE RAM	
Method	Example
A—Find vertical height to lift water (Call this A)	A = 100 feet (found by surveying—(Fig. 5))
B—Find vertical fall from spring to ram (Call this B)	B = 14 feet (found by surveying—(Fig. 6))
C—Subtract 2 from B to allow for losses in ram (Call the answer C)	C = 14 - 2 = 12 feet
D—Estimate gallons of water per day required (Call this D)	D = 550 gallons per day (estimated)
E—Add A and B to find total lift (Call this sum E)	E = 100 + 14 = 114 feet
F—Multiply D by E (Call this product F)	F = 550 x 114 = 62,700 foot gallons per day
G—Multiply C by 14.4 and this product by efficiency of ram (Fig. 9) (Call this G)	Since efficiency = 45 % (Fig. 9) G = 14.4 x 12 x 45 = 7776
H—Divide F by G to find gallons per minute required of spring	H = 62,700 ÷ 7776 = 8 gallons per minute required from spring
⑧ FINDING GALLONS OF WATER PER DAY AVAILABLE FROM SPRING	
Method	Example
I—Multiply 14.4 by gallons per minute from spring (Call this product I)	Spring delivers 10 gallons per minute and the fall is 14 feet. Water must be lifted 100 feet above spring. I = 14.4 x 10 = 144
J—Multiply I by C (See Fig. 7) and by the efficiency (See Fig. 9 for C) (Call this product J)	Since C = 14 - 2 = 12 and efficiency 45 % J = 144 x 12 x 45 = 77,760
K—Divide J by E to get gallons pumped per day (See Fig. 7 for E)	K = 77,760 ÷ 114 = 682 gallons per day



To find the efficiency of a ram, you first determine the lift ratio by dividing the height that water is to be lifted above the ram, by the fall from the spring to the ram

gals. of water per day. Referring to Fig. 6, we add the lift to the fall and multiply this by the number of gals. per day, that is, 550 multiplied by 114 or 62,700. Next, according to G of Fig. 7, the fall available for operating the ram, which is 12 ft., is multiplied by 14.4 which equals 172.8. We must next determine the efficiency of the ram by referring to Fig. 9. To do this we divide the height the water is to be lifted above the ram, or 114 ft., by the fall from the spring to the ram, or 14 ft., to get the lift ratio. In this case 114 divided by 14 equals 8. We locate this at the left side of Fig. 9, example A, follow across to the curve and down to the bottom and read 45 per cent as the efficiency. Multiplying this by 172.8, as shown in Fig. 7, we get 7,776 as the answer. The next step is to divide the first product, or F, by the second product G, or 62,700 divided by 7,776, which equals 8 gals. per min. as the amount of water which the spring will have to supply in order to furnish the required amount of water.

If the spring supplies 12 gals. of water per min. during the dry season, we will be safe in installing the ram. But if, after

making these determinations, it should be found that the spring will not deliver sufficient water, the next thing to do would be to figure how much water could be pumped per day during the dry season. Fig. 8 illustrates the method of making this calculation. Then, after you have found that there is sufficient fall available to operate a ram, the job of figuring the exact size required, and how to install it, comes next. This will be thoroughly covered in the next installment, which will also contain workable methods of making parts cheaply from pipe fittings in case you prefer to make these parts yourself. Hydraulic rams are also manufactured in a number of sizes and varieties, and they have the advantage over simple homemade ones in that they have been developed for long service and minimum trouble.

(To be continued)

Greeting Cards Are Displayed in Holder of Wire

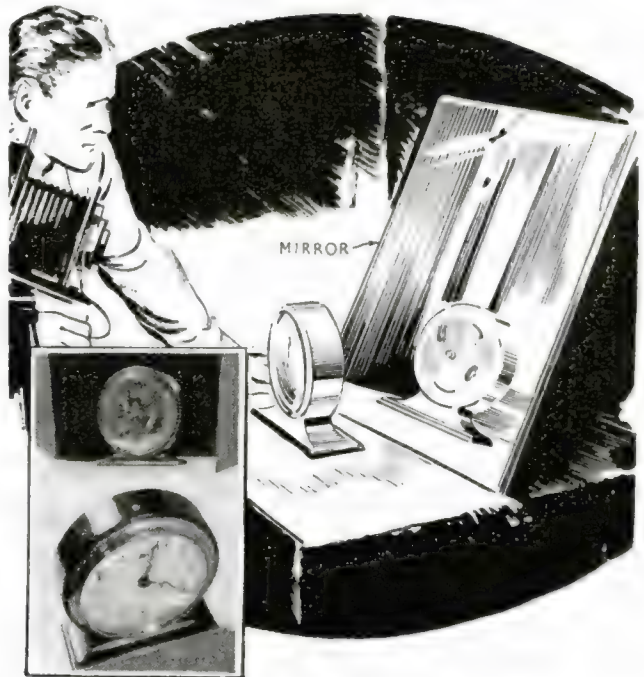
To avoid having his stock of sample greeting cards thrown about in heaps upon the counter or showcase, one dealer holds them in this novel rack. It consists



Sample greeting and view cards displayed in coils of brass spring are kept in neat order

merely of a length of coiled brass wire, soldered together to form a large hoop. The sample cards are inserted between the spring coils. Customers seldom fail to replace them after making their selections.

Two Views on One Negative Taken with Aid of Mirror



By reflecting one side of an object in a mirror, you can photograph front and back views in one "shot"

For advertising purposes, where front and rear views of an object must be shown photographically, both views may be taken at once on one negative if a mirror is placed behind the object. The camera is set so that the front of the object is clearly shown and also the reflected image of the back. A sample of this method is shown at the lower left. The finished print may have both views or each view can be enlarged on a separate print. In studios where considerable work of this type is done, quite a saving in negative cost can be made.—J. Modroch, Detroit, Mich.

Hack-Saw Blades Are Stored in Pipe Nipple

Instead of keeping your hack-saw blades hanging on a nail or lying in a drawer, where they are likely to be scattered around, why not

make this simple holder to store them? It is a long pipe nipple fitted with a pipe cap at each end. This idea can be applied to scroll-saw blades by using a shorter nipple.—Ralph R. Spain, Festus, Mo.



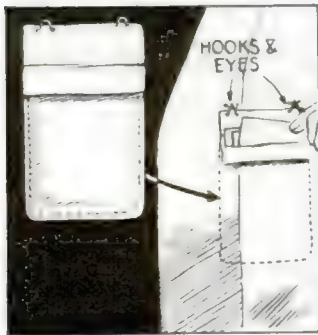
Sturdy Cart for Welding Tanks from Pipe and Brake Drums



This welding-tank cart is an easy job for a mechanic, costs practically nothing and rolls easily

Needing a strong two-wheel cart on which to move his welding tanks about the shop, a mechanic made a sturdy one from pipe and a couple of rear-brake drums taken from an old Ford car. The drums are mounted on an axle 34 in. long, and the frame, which consists of a length of pipe bent to a large U-shape, is attached to the axle by means of steel brackets welded in place, the brackets being just long enough to raise the frame above the top of the drums. Two or three cross members welded to the frame help cradle the tanks, which set on a platform made from a wide piece of flat iron welded to the ends of the frame. Two short lengths of angle iron projecting forward from the platform keep the cart from tipping when set upright.

False Pocket Keeps Agent's Papers in Order



Insurance agents and salesmen who have experienced loss of some of their papers, when they were removed from their pockets and laid aside temporarily, will find this false

pocket handy. It is made to fit inside their regular coat pockets where it is held with hooks and eyes. All papers and memorandum books are kept in the false pocket, which is removed when a paper is wanted.

Powdered Rosin in Small Sack Handy around Workshop

An empty tobacco sack containing some powdered rosin comes in handy around a workshop or in a car. When tool handles become slick and hard to hold, rub the little sack of rosin over them. Enough of the powder comes through to make the handles easy to hold to. The steering wheel of a car also becomes slick. This can be fixed easily with the rosin bag.

—Fred Cornelius, El Paso, Tex.

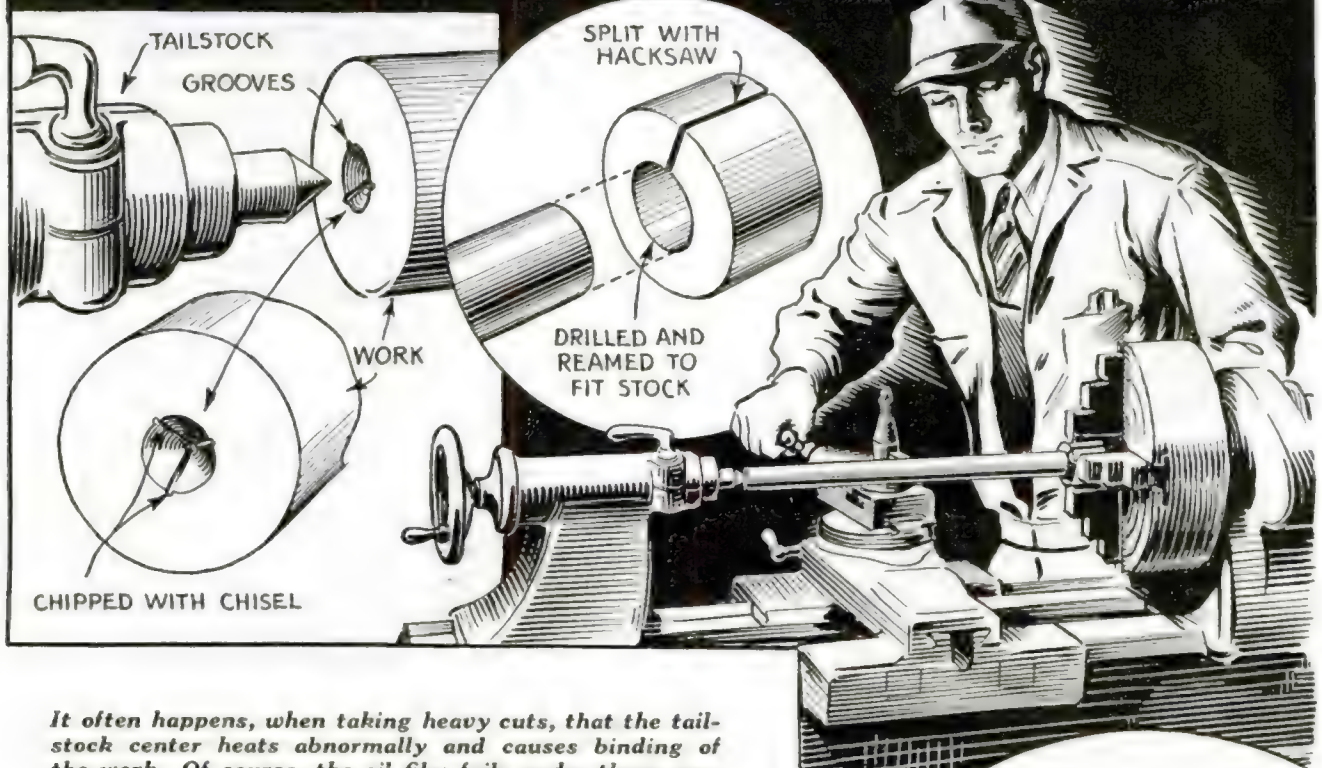
Auto-Casing Shock Absorber in Hay Rope

When a single horse is hitched to the carrier rope to lift hay from the load into the mow of the barn, the animal frequently suffers much discomfort from the jar or shock imparted to the harness when the pull begins. To avoid this, one farmer hitches an old auto casing to the single-tree and attaches the carrier rope to this. The sudden jerk on the rope is then taken up by the elasticity of the tire and the horse may begin the pull more naturally and easily.

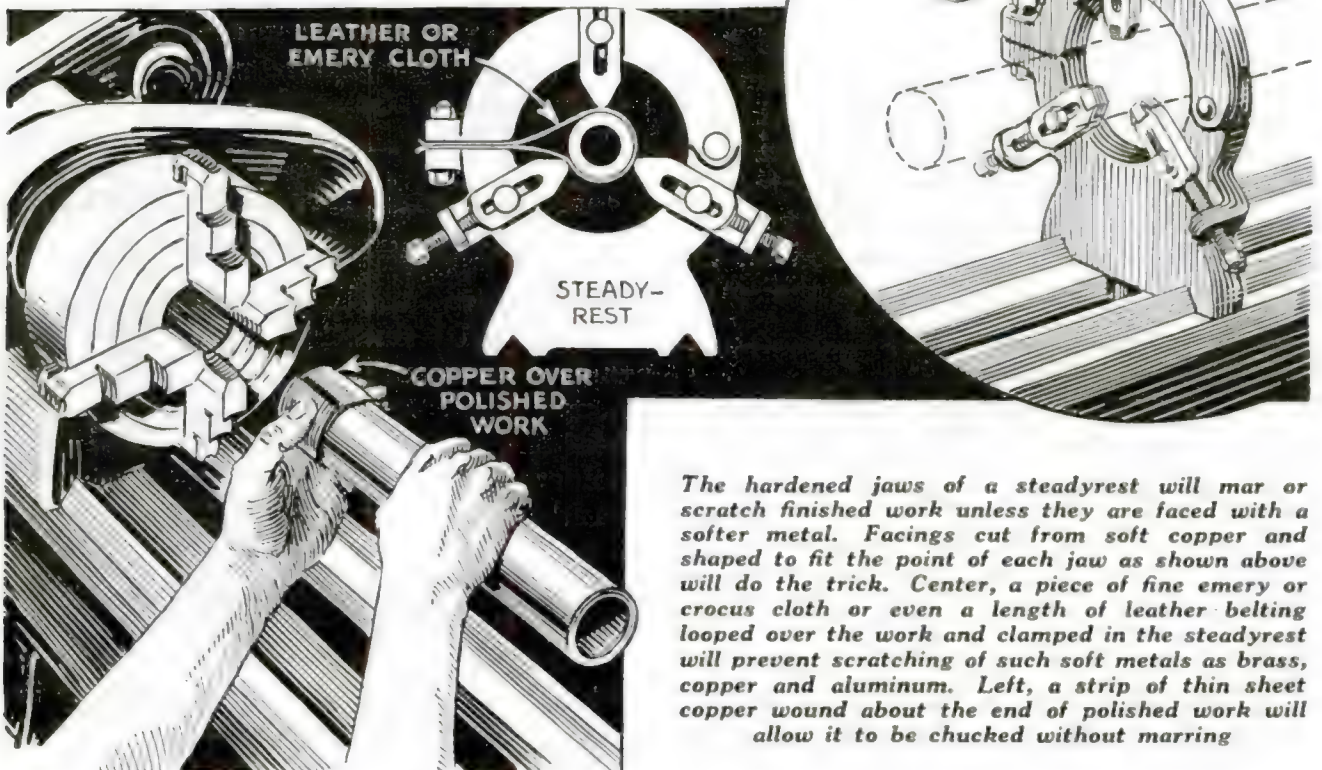


Jerking on a horse's shoulders, when starting a loaded hay fork, is avoided with this shock absorber

HELPS *for the* MACHINIST

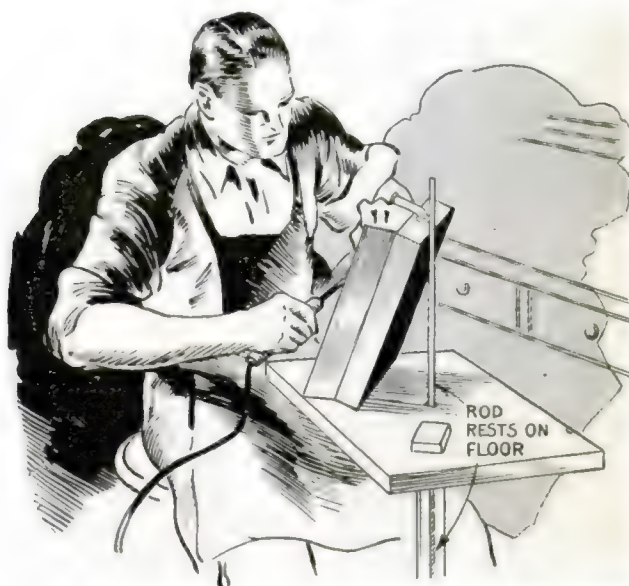


It often happens, when taking heavy cuts, that the tail-stock center heats abnormally and causes binding of the work. Of course, the oil film fails under these conditions. One remedy that nearly always corrects the trouble is chipping the tapered center hole in the work with a sharp cold chisel as shown above at the left. When you have to machine rods so small that the chuck does not grip them firmly, a split collar solves the problem as shown at the right above. It takes but a few minutes to make up an assortment of these collars for various sizes of small rods



The hardened jaws of a steadyrest will mar or scratch finished work unless they are faced with a softer metal. Facings cut from soft copper and shaped to fit the point of each jaw as shown above will do the trick. Center, a piece of fine emery or crocus cloth or even a length of leather belting looped over the work and clamped in the steadyrest will prevent scratching of such soft metals as brass, copper and aluminum. Left, a strip of thin sheet copper wound about the end of polished work will allow it to be chucked without marring

Work Rest on Welding Table Saves Time

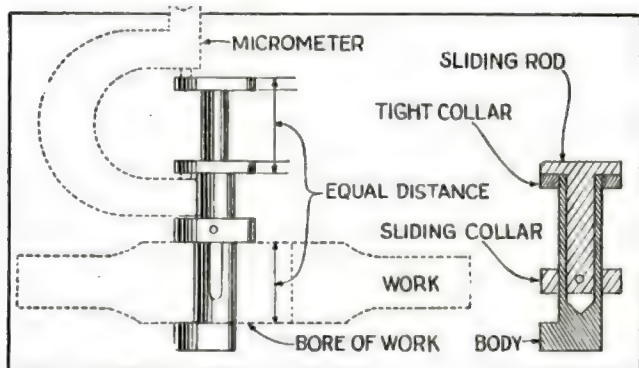


Work supported at angle against rod projecting from welder's table is easy to get at

To afford better access to certain types of work, one welder supports it at almost any angle against an iron rod, which projects through the table top. A small hole is drilled in the center of the top and the rod is inserted through it into the hollow table standard, which supports it. When not in use, the rod is removed.

Micrometer Extension for Places Hard to Reach

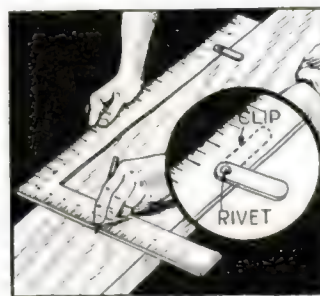
You will find many jobs on which to use this micrometer extension as it permits work to be "miked" where ordinarily the frame of the micrometer would not permit its use. The extension consists of a body turned and drilled transversely through the center to take a sliding collar on the outside and a sliding rod on the inside. The collar is pinned to the lower



Tight places that cannot be reached with a micrometer are easily taken care of with this extension

end of the rod, and a slot through the body enables this assembly to slide up and down. A fixed collar is pinned or sweated at the upper end of the body to complete the extension. When the distance from the top face of the sliding rod to the lower face of the fixed collar is one inch, the distance between the lower face of the sliding collar and the top face of the shoulder on the body is the same, these distances being equal in any position. In use, place the extension on the work with the shoulder projecting over the underside of it and push the sliding rod down to bring the sliding collar into close contact with the upper side of the work. Then "mike" the distance from the underside of the fixed collar to the top surface of the sliding rod. This distance is equal to the thickness of the work.

Steel Turnbutton Improves Square for Marking Boards

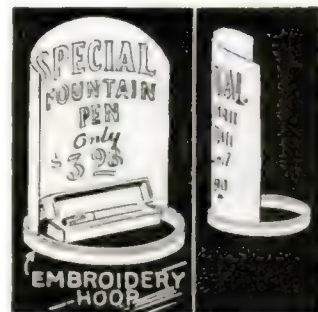


Squaring boards and timbers with a large, steel square is made easier if a small strip of steel is riveted snugly onto the long blade of the tool as shown. When turned to the position indicated, the strip will support the square against the edge of the board to be marked.

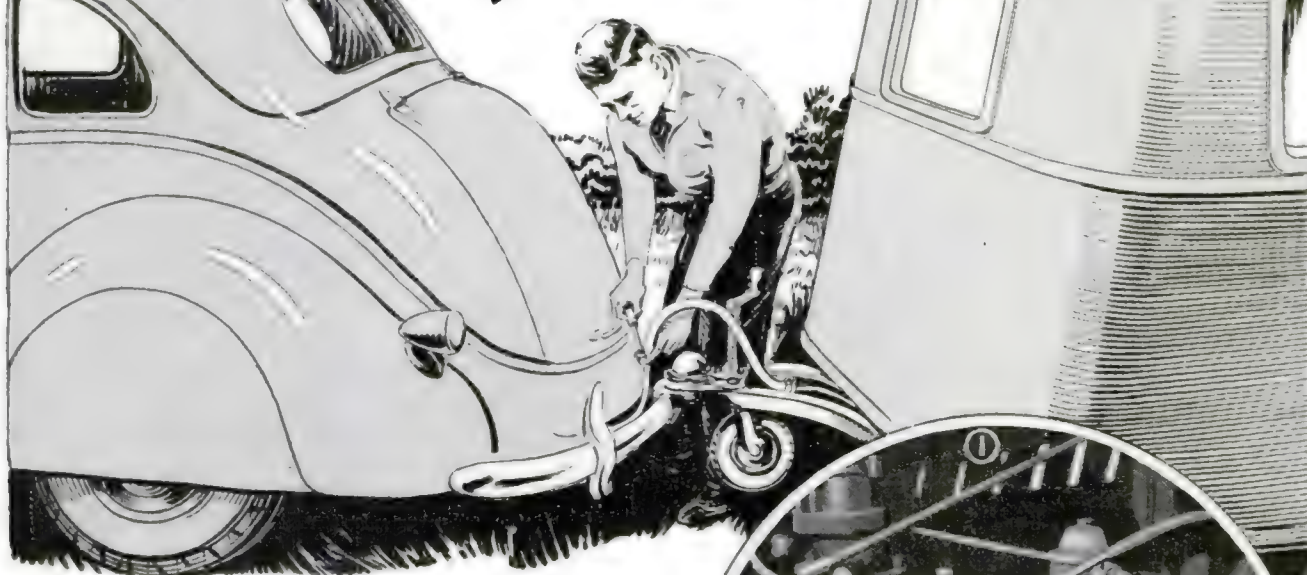
Show Cards Displayed Neatly on Embroidery Hoops

Jewelers and others will find that embroidery hoops make very neat and practical holders for display cards, either in the window or on the showcases.

The hoops support the display card and contain the merchandise upon which it is desired to center the attention. The hoops may be used also to support the cards in reverse position.

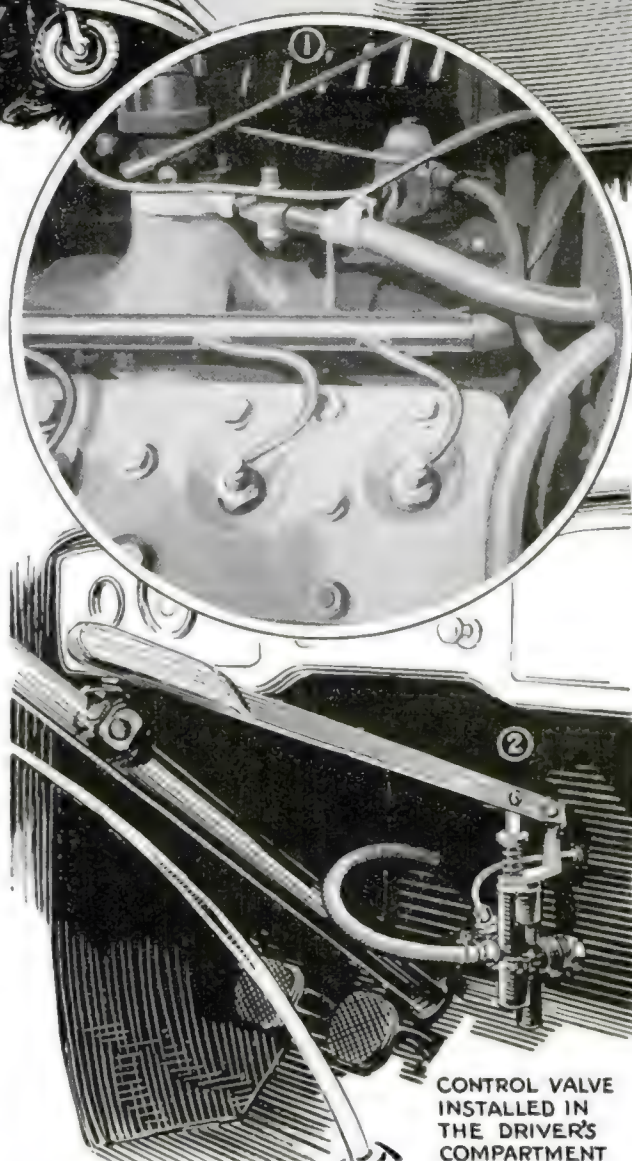


Vacuum TRAILER BRAKES *give smooth stops*



GIVEN severe tests for several months in the Adirondack country, these trailer brakes have proved satisfactory. Similar ones can be installed inexpensively by anyone. As shown in Fig. 5, vacuum in the car motor is utilized to work the brakes, and is carried through rubber hose, copper tubing and a vacuum valve to a vacuum cylinder, which actuates the brake-rod or cable assembly. The valve and cylinder are the type used to operate an automatic clutch of a 1932-33 or '34 Plymouth car.

After obtaining the valve and cylinder from a junk yard, wash them thoroughly with gasoline. You'll notice that there are three sets of valves in the assembly, Fig. 4. One of these is a pendulum valve, which is not used. The other valve is really two slide valves in one assembly, which makes up the vacuum control. The cap on the end of the valves is removed and the valve slide with the two keyways is changed as shown in Fig. 6, the end of the slots being filled with solder or brazed. If you resort to soldering, chloride of zinc will have to be used in place of regular soldering paste or acid. The ends of the keyways and the end slot should be filled above the outside surface of the slide and then smoothed with a file and emery to a snug, sliding fit, after which a by-pass $\frac{1}{2}$ in. wide is



cut in the wall separating the keyways. In the other end of the slide, two holes are drilled to allow air to return to the vacuum cylinder and release the brakes

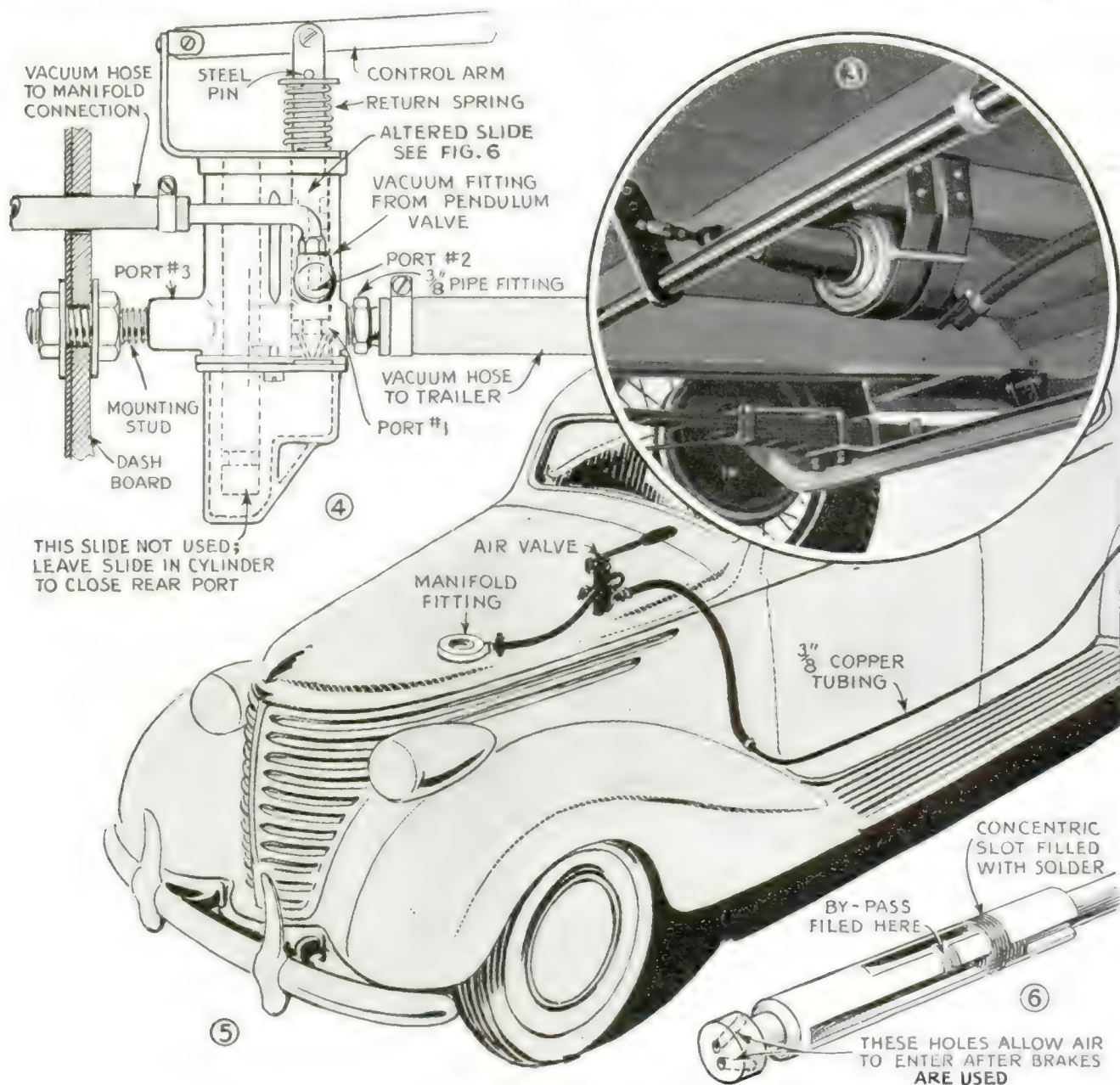
after the control arm has been released.

Before assembling the valve, port No. 1, Fig. 4, is carefully drilled and tapped for a short length of $\frac{3}{8}$ -in. pipe threaded at one end and fitted with a lock nut. One of the copper-tube fittings taken from the pendulum valve is screwed into port No. 2. A short piece of copper tubing from the pendulum valve can be used here for a hose connector. Port No. 3 is used to hold the mounting stud, which is a short piece of $\frac{3}{8}$ -in. pipe, threaded on one end to screw into the port, and on the other end to take two standard nuts. Be sure that the slides are returned to their original positions. If they are misplaced, the valve will not function properly. The inner slide should be pushed all the way in to close port No. 3. A few drops of oil should be put on the slide before replacing it. Also,

the air hole should be enlarged slightly. The altered slide is now pulled out of the top as far as possible and a coil compression spring, about 2 in long, is placed on it, and held slightly compressed with a washer and a steel pin. The spring closes the valve when the control arm is released.

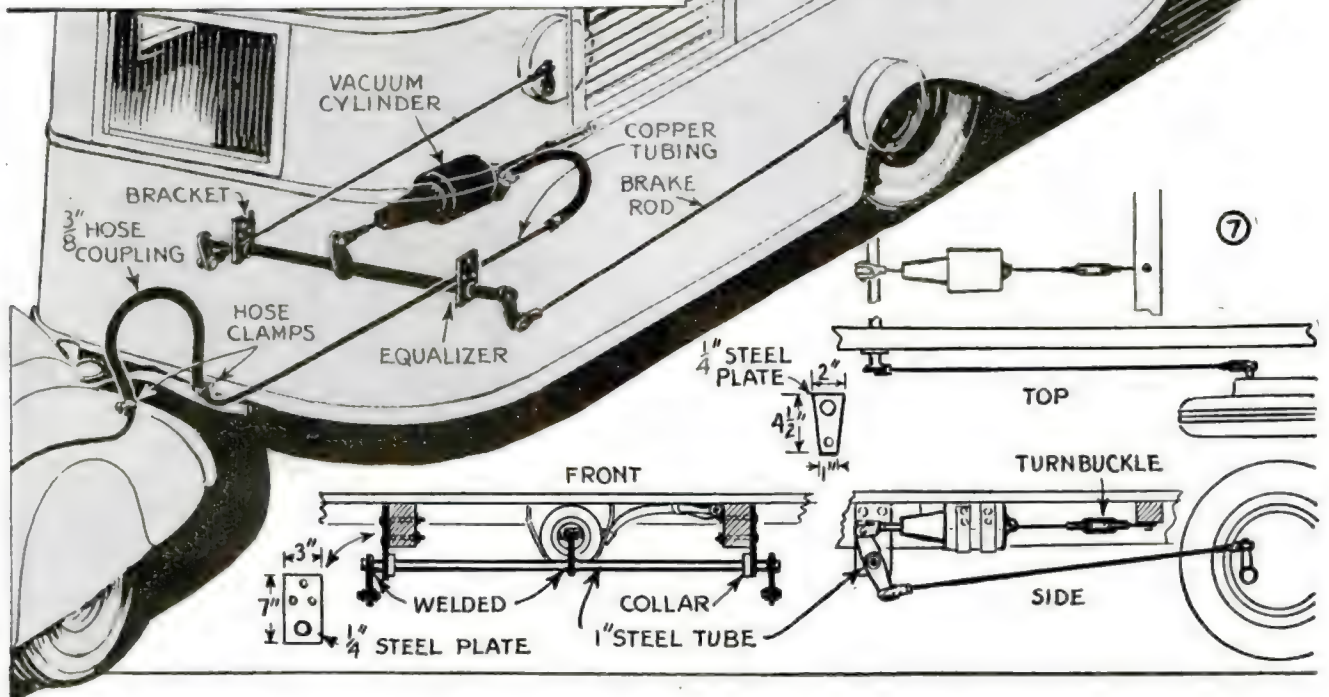
The control valve was designed for hand operation as manual control permits synchronization of the trailer and car brakes. It is also more flexible in operation than a valve that works in conjunction with the car foot brake; it allows independent action of the car or trailer brakes and automatically shuts off the vacuum line when the brakes are not in use.

Having altered the valve and provided it with a control handle as in Fig. 4, it is mounted on the car dash within convenient reach of the driver, as in Fig. 2, after



which port No. 2 is connected to the motor vacuum supply with a rubber hose. If your car has a single intake manifold, you first remove it, then drill and tap it as near the carburetor as possible for a $\frac{3}{8}$ -in. pipe fitting. Or, you can use a special fitting under the carburetor as shown in Fig. 1. On Ford cars and others having dual intake manifold, it is best to use only the fitting under the carburetor to get full benefit of the vacuum from all cylinders. The fitting can be obtained from most brake service stations. It's a good idea to install a cock in the line here so that the entire system can be shut off when the trailer is not being used.

Now's a good time to test the valve. Connect it to the vacuum cylinder with a short piece of hose, start the car motor and press down on the control arm. If everything is functioning properly, the piston in the cylinder should draw in suddenly with a powerful pull, in fact so

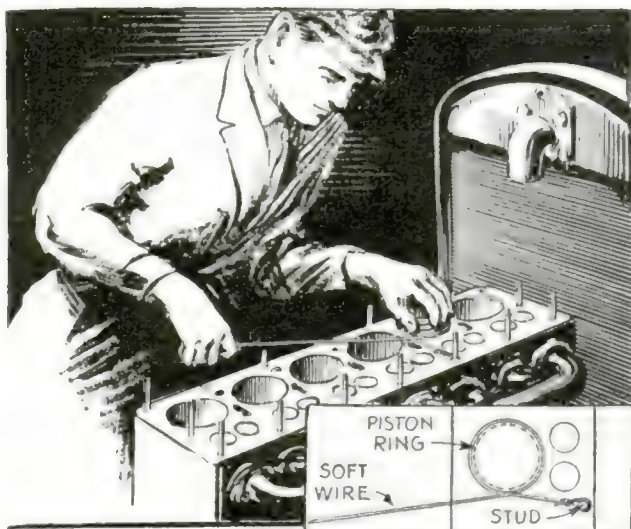


powerful that you can't hold it with your hands. If it does not, check up on your fittings. Do not worry about the hissing sound when the control valve is released. It is merely air returning to the evacuated lines and cylinder.

Next mount the cylinder under the trailer as in Fig. 3, and connect it to the valve, using rubber hose and copper tubing where indicated. Shellac all the joints carefully to avoid leaks. Fig. 7 gives details for the cross-rod equalizer, mount-

ing brackets, etc. Note that the rear end of the cylinder is connected to a cross member of the trailer body with a rod and turnbuckle so that the cylinder can be adjusted for stroke. Hook up the brake rods or cables to the equalizer and you are ready for a try-out. Go out on a road where you will not interfere with traffic. Adjustments are made by taking up on the brake rods the same as is done when taking up the rods on mechanical auto brakes.

Piston Rings Easily Compressed with Fine Wire



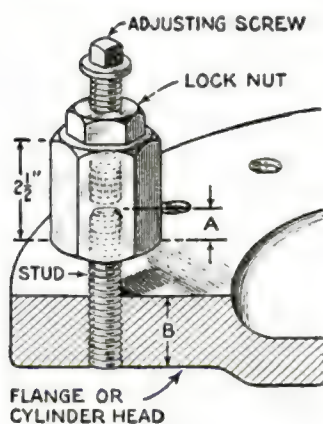
In an emergency, a length of wire can be used to compress rings to slip a piston into the cylinder

If you have no piston-ring compressor at hand when installing pistons in a motor, try using a length of soft, strong wire as shown. One end of the wire is fastened to one of the cylinder-head stud bolts projecting from the top of the motor block, after which the wire is given one turn around the ring as it rests on top of the block. Then merely pulling the wire will compress the ring.—W. Hockert, Chicago.

Die Ornaments for Control Knobs of Car Radio and Dash

If you have a die-shape ornament on your gear-shift lever, radio and dash-control knobs to match can be made from white or colored dice. File or grind one corner of each die flat and then drill it to fit tightly over the shaft of the control.

Stud-Bolt Setter Protects Threads

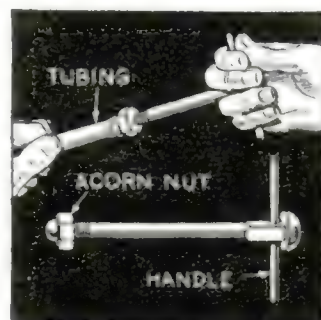


An efficient tool to remove or drive stud bolts is easily made from a 2-in. length of hexagon-shaped steel. The steel is drilled transversely through the center and is tapped to screw onto the stud bolt.

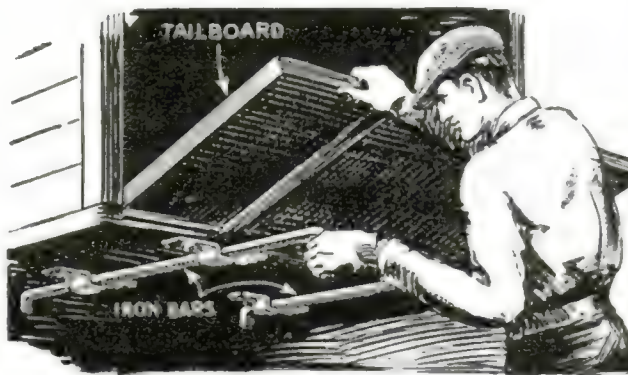
In use, one end of the tool is driven onto the projecting end of the stud bolt, and an adjusting screw, made from a piece of iron rod the same size as the stud, and fitted with a lock nut, is driven into the other end, after which a wrench is used to turn out the stud bolt.

Small Copper Tubing Flared with Acorn Nut on Bolt

Mechanics who frequently have to flare the end of a copper or brass tube can make up a set of tools to do the job from a few carriage bolts and acorn nuts. Drill holes through the shoulders of the bolts to take steel pins, which serve as handles, and drive the nuts tightly on the threaded ends.



Truck Tailboard Held Level with Sliding Bars



Heavy iron bars pull out from under truck body to support tailboard level with the floor

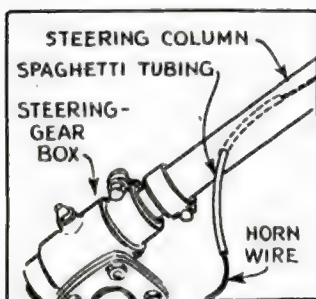
Truck drivers who want the tailboards held level with the floors of the body, will find that a couple of heavy iron bars, which slide in brackets under the body, will do the trick. The brackets are made of heavy flat iron, and the bars are bent downward at right angles at the ends, the bends at the rear ends serving as stops and those at the front as hand grips.

Vulcanizing Auto Tires

Heat used in vulcanizing automobile tires has a tendency to stiffen the tire and

cause a noticeable difference in the riding quality of the car. This trouble can be overcome to a certain extent by using the tire immediately after a repair has been completed. The flexing of the rubber will soften the repaired spot and tend to prevent permanent hardening.

Insulating Horn Wire in Column of Steering Gear



If you have trouble with the horn and other wires short-circuiting where they pass through the steering column, try insulating them with "spaghetti" tubing. This can be obtained at almost any radio repair shop. Do not use rubber tubing, as oil and grease in the column will soon cause it to rot.

—C. Pettrich, Bronx, New York, N. Y.

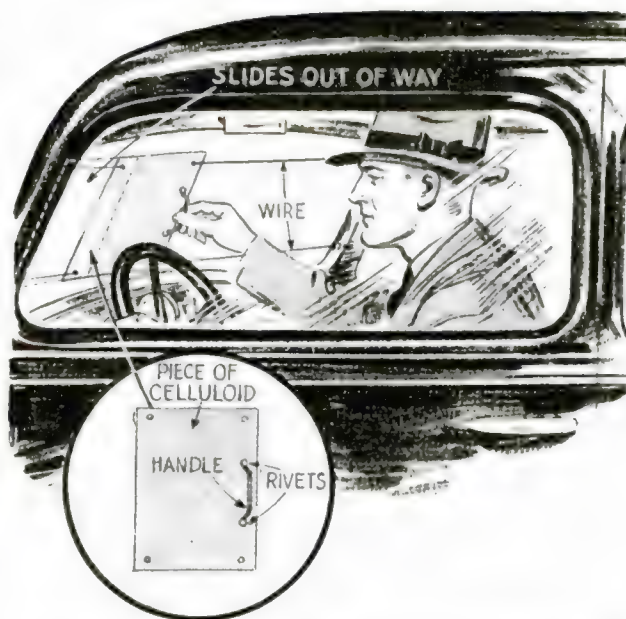
Hole in Side of Pail to Pour into Small Opening

When it is necessary to fill a radiator or gas tank with a can or pail, and no funnel is available, punch a small hole in the side of the pail near the top. Then you can pour out the liquid in a small stream without spilling.



It's easy to fill a radiator with a pail if you drill a small hole in one side

This Glare Shield Is Adjusted Across Entire Windshield

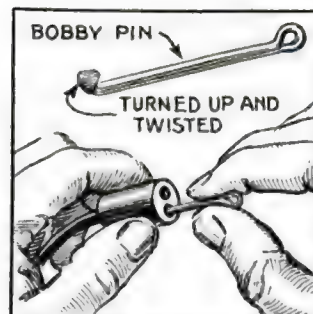


When you meet a car with glaring headlights, just pull this shield in front of your eyes

Sliding on two lengths of fine wire stretched across the inside of the windshield, a rectangular piece of colored celluloid provides the motorist with a glare shield that can be moved quickly to any position desired. The wires are fastened under screw heads holding the corner molding on the body posts. Each wire is run through two holes drilled in the shield as indicated. The shield can be fitted with a small drawer pull or knob.

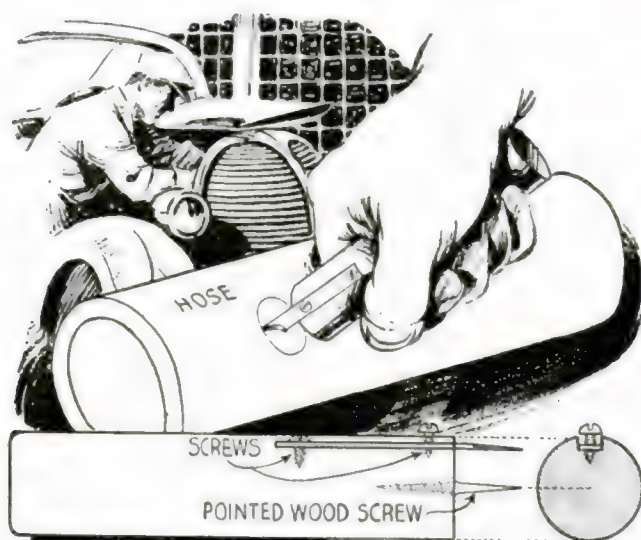
Cleaning Sleeve Connectors of Tail-Lamp Wires

Here's a tool for cleaning sleeve connectors used on stop and tail-lamp wires of Ford cars, which often become corroded or blackened inside so that current cannot pass freely. The tool is nothing more than a flat-wire hairpin or bobby pin. A short section at one end is turned upward at right angles, and is twisted slightly. This causes the flat end to cover a wider area when turned inside the sleeve.



—E. T. Gunderson, Jr., Humboldt, Ia.

Hose Cutter "Drills" Holes to Attach Heater Fittings



You can quickly cut clean holes in radiator hose and other rubber accessories with this tool

For cutting holes in radiator hose and other rubber accessories, a tool made from a piece of flat steel and screwed to a short length of broomstick or a dowel, will save time and do a neat job. After grinding one end of the blade to a curved cutting edge and drilling it for wood screws, a long

wood screw is driven part way into the end of the broomstick and is then ground to a point to serve as a center or pilot. Of course, the diameter of the stick or dowel determines the diameter of the hole cut.—M. J. Schram, Sayville, L. I., N. Y.

Sun Visor Controls Ventilation

On hot days when a direct draft of air is wanted while motoring, it may be had by proper adjustment of the inside sun visor. In cars with windshields that open, the visor

can be swung down so that the air, instead of sweeping along the ceiling, is directed downward on the driver. If the car is ventilated by pivoting forward halves of the windows, the visor can be swung around parallel with the side of the window opening and adjusted to direct some of the air down toward the car floor.

—C. E. Packer, Chicago.



The Next Issue

WEAVING FOR FUN AND PROFIT ON HAND LOOMS

Fun and spare-time money are yours after a little practice on any one of the several kinds of hand looms described in this story. Ranging from a simple one made on a board to a fairly elaborate table model, the looms are home-made, and you'll be surprised at the weaving speed you can attain.

ARE YOU AN ADMIRER OF TOOLED LEATHER?

It's no trick to tool artistic designs in beautifully colored leather pillows, belts, purses, etc., once you have learned a few secrets of the process.

TURNING ALABASTER IN YOUR LATHE

Beautiful vases, lamps, clock cases, ash trays and other things are turned from alabaster in your woodworking lathe with regular turning chisels.

CAN YOU TAKE SPEED PHOTOS?

Racing cars, trains and other speed thrillers are easy to photograph if you know the tricks and fit your camera with a few inexpensive gadgets.

"DRY-ICE" CABIN CRUISER

A 17-in. model propelled over the water by means of gas escaping from an immersed jet. Gas is generated by Dry Ice melting in its four "boilers."



Stretch out vacation trails

Yes, siree—you s-t-r-e-t-c-h out your vacation when you ride a 1937 Harley-Davidson. First—it widens your cruising range—takes you to more distant places. Second—its marvelous economy makes your vacation budget last longer. Third—it gets you to more places in less time. And fourth—you have your Harley-Davidson for evening and week-end fun. You stretch your vacation joys over the entire year!

So own a new 1937 Harley-Davidson—and thrill to its zooming speed and surging power! Enjoy its gliding ride and flashing style—its carefree operation—and most important of all the low-cost mileage made possible by its many advanced motor improvements.

See your Harley-Davidson dealer—take a thrilling ride FREE—then ask about his Easy Pay Plans. And send in the coupon—TODAY!

HARLEY-DAVIDSON MOTOR CO., Dept. P, MILWAUKEE, WIS.



Ride a

HARLEY- DAVIDSON

MAIL THIS COUPON
HARLEY-DAVIDSON MOTOR CO.,
Dept. P, Milwaukee, Wis.
Interested in motorcycling. Send illustrated literature. Postage stamp is enclosed to cover mailing cost.

Name

Address

My age is ☐ 16-19 years, ☐ 20-30 years,
☐ 31 years and up, ☐ under 16 years,
Check your age group.



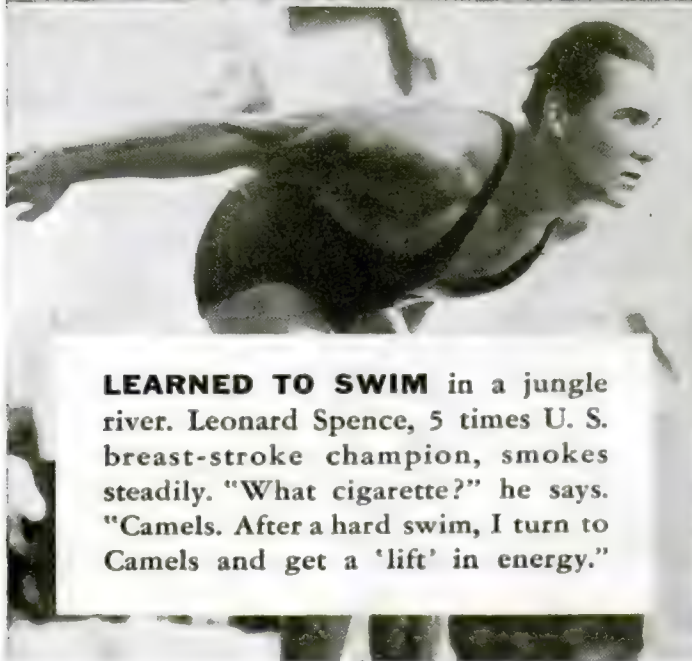
FLOYD STIMSON (above), between puffs of his Camel describes a typical parachute jump. "I ease out of the cockpit, holding onto the edge as I stand on the wing hooking one foot behind a



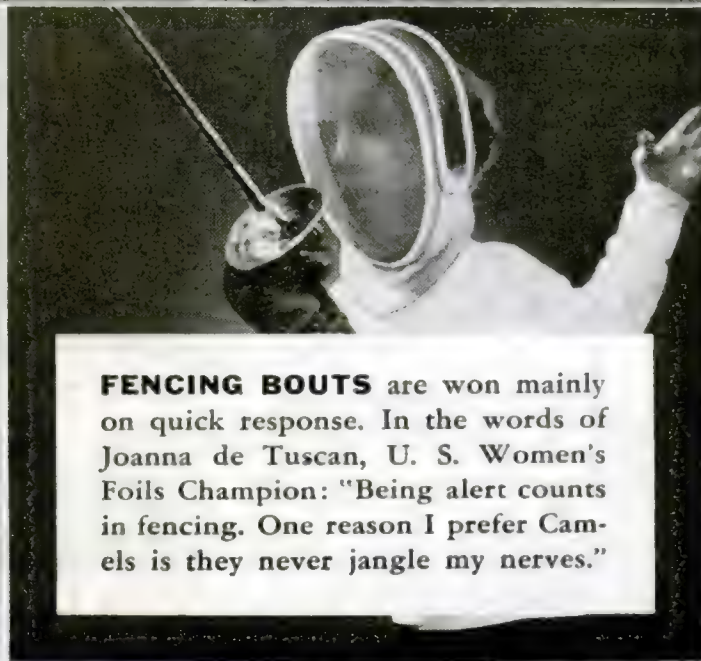
strut wire. Then I crouch down and dive over, headfirst. I watch out for getting cracked by the tail. I crouch down so if the tail should hit me, it would only strike my foot. I usually make 2 or 3

MAN OVERBOARD

**FLOYD STIMSON
OFFICIAL PARACHUTE
TESTER—BAILS OUT
FOR THE 1060th TIME!**

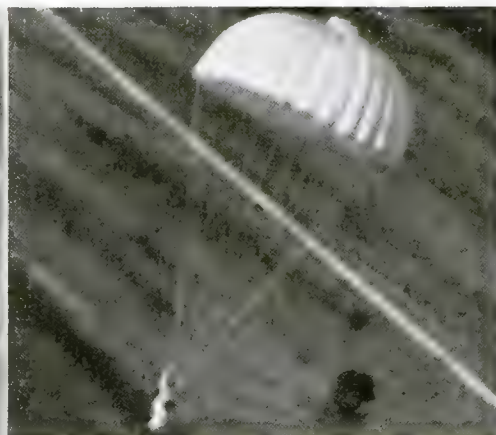
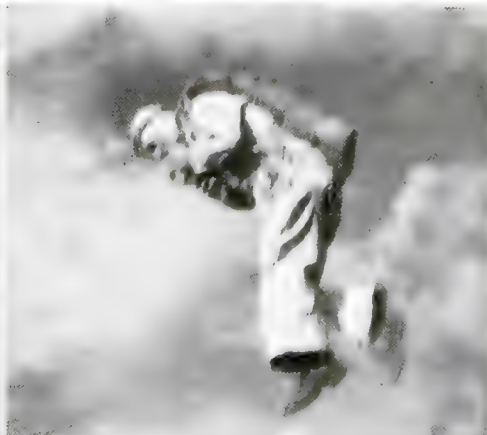


LEARNED TO SWIM in a jungle river. Leonard Spence, 5 times U. S. breast-stroke champion, smokes steadily. "What cigarette?" he says. "Camels. After a hard swim, I turn to Camels and get a 'lift' in energy."



FENCING BOUTS are won mainly on quick response. In the words of Joanna de Tuscan, U. S. Women's Foils Champion: "Being alert counts in fencing. One reason I prefer Camels is they never jangle my nerves."

When writing to advertisers please mention Popular Mechanics



turns. (In the next picture Floyd has completed a turn and straightened up.) When I'm facing the sky, I pull the

rip cord. It's a sweet feeling when she blooms open. It's like having a seat in the clouds—with the earth rushing up to you." Floyd's

work is no job for a nervous man. His cigarette is Camel—has been for 10 years. He says: "They don't frazzle my nerves."

**Dangerous work — yes — but
Floyd Stimson has the healthy
nerves that the job requires!**

HE'S stepped out into empty air well over 1000 times—yet landed right side up every time. "My order is Camels," Floyd says. "They're so mild I can smoke all I want to, knowing that Camels never frazzle my nerves. It seems as though there's no bottom in sight when I bail out—and my stomach knows it, too," Floyd Stimson continues (*right*). "However, a Camel helps me ease off. *Camels set me right!*"



**BENNY GOODMAN
SWINGS IT EVERY
TUESDAY NIGHT!**

Tune in! Hear the trio — the quartette — and all of Benny's boys swing the popular favorites. Tuesdays—8:30 pm E.S.T. (9:30 pm E. D.S.T.), 7:30 pm C. S.T., 6:30 pm M. S.T., 5:30 pm P. S.T., over WABC-CBS.

MILD!

• Camels are made from finer, **MORE EXPENSIVE TOBACCOS** — Turkish and Domestic—than any other popular brand

Copyright, 1937, R. J. Reynolds Tob. Co.,
Winston-Salem, N. C.



Camels never get on your Nerves!

When writing to advertisers please mention Popular Mechanics

Snapshots

(Continued from page 245)



This pair of skaters was snapped by a photographer in the audience at an ice carnival

tures do not lend themselves to angle photography, of course. Never get into a rut. Just as a good newspaper reporter develops a "nose for news," the successful amateur photographer must develop an "eye



Stand close to a locomotive and focus on its giant wheels for an angle picture giving a sense of power

for pictures." His eye must tell him which subjects make good angle shots, and which should be photographed in the conventional way. It's all in the point of view.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

Torture Chambers

(Continued from page 191)

pound safe to see whether the papers inside it will be protected from fire. If the safe doesn't explode in the sudden heat, they leave it a full hour. Then, red hot, they hoist it to the top of a three-story tower and dump it into a pile of bricks. If that fails to wrench the door open and expose the contents to fire, they tip the safe over and give it another hour in the furnace. If the papers are burned, or thermocouples show a temperature inside exceeding 300 degrees, the safe has "flunked."

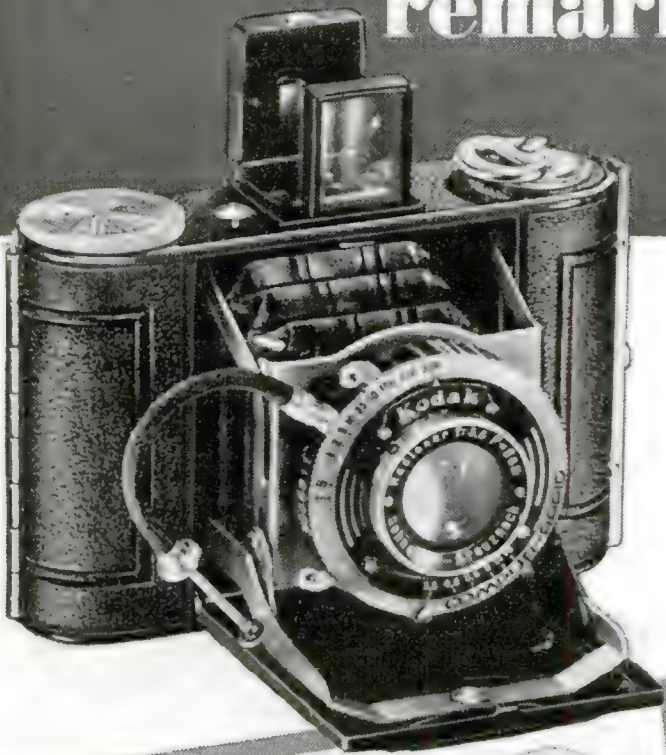
When you step on the starter of your automobile, "U.L." is protecting you. In factory or laboratory its engineers give a terrific drubbing to fuel lines, ignition system and exhaust of every domestic make of car. The gasoline line is shaken for seventy-two solid hours in a machine vibrating 600 to 1,500 times per minute. An explosive mixture is piped into the muffler and set off by a spark plug, simulating a violent backfire. The muffler has to take twenty-five terrific wallops and still be safe and sound. And if your car doesn't burst into flame tomorrow it is partly because of the test they give your air cleaner. It is only incidentally an air cleaner, you know; its real purpose is to prevent a flare-back into the carburetor. In the laboratory they pack it with cotton, and set off a flare-back by means of a spark plug in the manifold. If the cotton is burned, the air cleaner is not properly guarding the carburetor.

The Underwriters' Laboratories are even interested in your safety matches. They put a sample match on an anvil and drop a metal block like a trip hammer on its head. The match must not be ignited by shock. Another machine tries to break the wooden stem, for safety matches must not split when you strike them. A dozen matches are placed side by side in a vise and lighted; if they sputter or spit flaming bits, they go back to the manufacturer unapproved. And finally, so that you'll feel safe in leaving safety matches on stove or radiator, there is a heat ignition test. A match and a thermometer are dropped into a test tube which is inserted in an oil bath and heated until the match ignites. If the match flares up below the safe limit of

(Continued to page 118A)

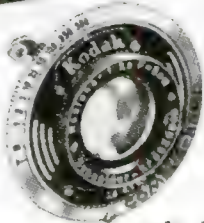
Full-range "miniature" at a remarkably low price

...\$44⁵⁰



LENS . . .

Anastigmat f.3.5. You get sharp negatives from dawn to dusk; in clear, cloudy or rainy weather. Also makes snapshots indoors at night under Photofloods.



SHUTTER . . .

Rim-set Compur-Rapid gives you nine speeds up to 1/500 second for fast action—down to a full second for difficult light conditions.

REVOLVING LENS MOUNT . . . For quick, easy, accurate focusing from 3½ feet to infinity.

**YOU GET 16 PICTURES
ON AN 8-EXPOSURE ROLL**



Kodak Vollenda gives you 16 pictures, each 1 3/16 x 1 9/16 inches, on a roll of Kodak Film No. 127: Verichrome, 25¢; "SS" or Panatomic, 30¢.

Your negatives are critically sharp, and capable of extreme enlargement—especially when Kodak Panatomic Film has been used.

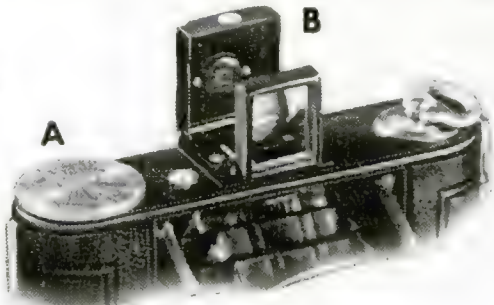
KODAK VOLLEND A in hand, you're ready for every picture that comes along—off-guard snaps, lightning-fast sport shots, landscapes, close-ups, rainy-day pictures, indoor snapshots under Photofloods . . .

Brilliant f.3.5 anastigmat lens; 1/500-second Compur-Rapid shutter. Negatives are sharp, capable of extreme enlargement—especially when Kodak Panatomic Film is used.

See Kodak Vollenda at your dealer's. Weigh range and refinements against price, \$44.50—you'll say it's the buy among "miniatures" . . . Eastman Kodak Company, Rochester, N. Y.

ONLY EASTMAN MAKES THE KODAK

DEPTH-OF-FOCUS SCALE (A) Rotating outer ring shows sharp-focus range for any stop-and-distance combination. **FINDER (B)** . . . Direct-view, eye-level type; folds flat when not in use.



ACTION FRONT

Actuated by push button, automatically opens camera, extends bellows, erects lens, and locks front firmly in correct picture-making position.

KODAK VOLLEND A

When writing to advertisers please mention Popular Mechanics

(Continued from page 116A)

340 degrees, it's not safe to leave around in hot places. To guarantee that your kitchen stove is foolproof, they set it against a corner built of black pine boards



This machine "tortures" lamp sockets and switches by turning them on and off thousands of times

which will absorb heat; then they turn on all the burners. If those boards warm up beyond 194 degrees, the stove is not properly insulated and might set the house afire.

A special torture is reserved for your electric refrigerator. After undergoing tests for shock and fire hazard, toxicity of its refrigerant and safety of its compressor, it is allowed to rest in a hot chamber until the entire box and mechanism have reached a temperature of 104 degrees. Then the freezer is turned on, putting the refrigerator to work at a punishing pace, while inspectors watch its reaction.

Electric current as low as seventy-five hundredths of an ampere can kill you. The Underwriters' Laboratories play safe. They permit no more than one-hundredth ampere leakage from any electrical appliance. They take your radio, juggle the tubes around as you would never think of juggling them, give the circuit a 500-volt shock and insist that under the very worst conditions the radio must not overheat or catch fire, its insulation must be adequate and all hazardous current-carrying parts must be inaccessible. If you'd

rather feel safe from shock in using your electric washing machine, see that it has the "U.L." tag. Then you will know, too, that the wringer is not likely to scalp you or crush a hand. The Underwriters require automatic release of the wringer under pressure. Recently they put a rotary ironer through its paces and saw it perform acceptably until, in a last attempt to break it down, they locked the heater arm to the roller a few moments with the current on. Suddenly the cloth pad burst into flame. That ironer went back to the factory for some changes. The heater control should have prevented any fire.

So if you're going to leave town and forget that the oil burner and refrigerator and kitchen stove and movie projector, the toy railroad and electric fan and iron are all connected, better make certain they all bear the safety label of the Underwriters'



Ability of "air cleaner" to prevent flames reaching carburetor of auto is tested by inducing a backfire

Laboratories. The safety engineers don't recommend that you take those risks. But if the household appliances are "U.L." approved you know they've been tested under pretty rough abuse.

¶ Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information, inclosing return postage.

Half & Half Makes ONE Swell Smoke!



No Bite!

No Bite!

Still no Bite!

Not a bit of bite in the tobacco or the Telescope Tin, which gets smaller and smaller as you use-up the tobacco. No bitten fingers as you reach for a load, even the last one.

Half & Half doesn't bite, even when the fish do. Cool as the sign: "No Fishing Allowed." Smooth as a permit that gives you the right. Fragrant, friendly, full-bodied tobacco that won't bite the tongue—in a tin that won't bite the fingers. Made by our exclusive modern process including patent No. 1,770,920. Cool and smooth. Smells good. Makes your pipe welcome anywhere. Tastes good. Your password to pleasure!

Copyright 1937, The American Tobacco Co.

HALF AND HALF

The Safe Pipe-Tobacco

FOR PIPE OR CIGARETTE

es 368

10¢ WORTH OF
SANI-FLUSH
WOULD MAKE IT
SO MUCH COOLER!



WHEN a radiator gets hot you lose power and you endanger your motor. Costly repair bills may result. Don't take a chance. Sani-Flush cleans out automobile radiators in a few minutes. You can do it yourself!

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Dept. PM-81



Thrills of the Navy Test Pilots

(Continued from page 229)

single-float seaplane is different from a big boat and the pilot makes a "stall" take-off, pulling the stick back at the right moment and bouncing up into the air. An inexperienced pilot may try for hours to get a flying boat up into the air if the water is rough. He has to be told at just which angle to cut across the waves in order to get off. The big boat pilots haven't any convenient wind socks to tell them which way the wind is blowing. The smoke from a steamer may be a guide and otherwise they have to read wind direction by hunting for streaks of foam on the surface or by watching the spray pulled off wave crests. A dead calm in which the water is glassy still calls for a "hot" landing that takes nearly as much skill as sitting down on rough water. The surface looks like a mirror to the pilot and he can't tell whether he is two or fifty feet in the air. If he levels off too soon his bad guess would wreck the boat, so he flies downhill as slowly as he can with power on until he hits. The shape of the hull helps absorb the shock.

In a dead calm, also, a pilot may have a hard time getting off again. When the water is flat a boat sometimes can't break itself loose from the surface. In that case the pilot taxis around in fast tight circles to stir up the water, then makes a fast take-off run across the circles.

Being a surface craft as well as an airplane, a flying boat gets all sorts of tests that no land plane is ever given. When a new Douglas flying boat is launched for its tests the first routine is to find out how it handles on the water. A full crew of pilots and engineers climb on board. At the controls may be Glen Moser, chief pilot, and alongside him Al Reid, co-pilot and engineer. Mike Hunt and another mechanic stand by in the cabin, while Schuyler Kleinhans, project engineer, and several observers strap themselves into the seats.

A good duck should handle just like a boat on the surface. First of all Moser simply taxis around on the water and makes left and right turns across the wind. He wants to know how much rudder control is needed to swing the boat. Then he

20368

tries turns using one engine as well as the rudder to turn the plane. From the cabin windows the engineers watch the wing pontoons, which are retractable into the wings these days, to find out whether they are large enough and strong enough to keep a wing from dipping under.

No airplane has a reverse on it but the big boats can sail backward down wind by allowing the engines to idle. Another test is to turn tail to the breeze and taxi slowly down wind. The big control surfaces of the tail are apt to catch the wind and make the plane yaw around, and the pilot has to know how much control is necessary to hold a straight course. Next come the high-speed taxi tests with the plane churning along through the water on its step just under fifty miles per hour. No turns are made at these high speeds and the courses are straight runs into the wind and out of it. With unlimited water in front of him a pilot can take off with the wind behind, something not recommended for land planes.

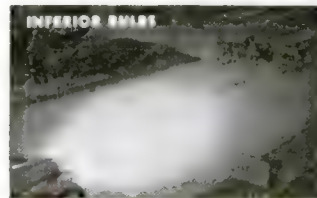
The first few flights are made with no other load but the crew, merely to learn how the boat handles in the air and to check the instruments and controls. Usually small details have to be adjusted and after that whole groups of tests are made while the boat carries increasingly larger loads of lead bars. The engineers want to know the safe minimum flying speeds for all loads, rates of climb and descent, take-off time, ceiling and maximum speeds. To check and calibrate the air-speed indicators the pilot races along a speed course marked out on the beach with a stop watch in his hand to mark his elapsed time. With a full load of 28,500 pounds on board, one of the new twin-engined Douglas boats climbs 600 feet per minute and has a high speed of 185 miles per hour. Flying boats can lift heavier loads into the air than land planes because they have all the take-off room in the world.

Just like other large surface boats, flying boats have watertight doors in their hulls. On the Douglas the six different compartments are sealed with light strong doors that can be closed or opened in a few seconds. A lightweight collapsible anchor, a bilge pump, life belts, boat hook, and signaling flares are included in the marine equipment.

State inspections show that:

3 out of 4 cars

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RECENT figures indicate that the nighttime auto accident rate is still going up, while the daytime rate is going down.

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New Progress in Fireproofing

(Continued from page 254)

gas ignition. Several tests are based upon the probability of ignition from a given heat source within a specified time, or upon persistence of flames or glowing of the wood after removal from the source of heat. Measuring the time required for a flame to penetrate a piece of wood has been another common test. In other tests the height of flame from the burning wood is taken as the measure of inflammability. Heat insulation, which is closely related to flame penetration, is another test. The depth of flame penetration in a board and the time required for a loaded timber to fail when subjected to flame also have been used for fireproofing tests.

All of these tests show differences in fire resistance of common wood and fireproofed wood, but because of so many uncontrolled conditions the tests lack definite units of fireproof measure. Lack of standard tests has been the greatest barrier to progress in fire-treating wood.

Technicians of the U. S. Forest Products Laboratory recently developed a test which has won the acceptance of the American Underwriters' Association and fire-department experts throughout the nation. It is a simple fire-tube apparatus, consisting of an open galvanized-iron tube in which a specimen of wood is burned while suspended from a balance arm. The fire tube is about fifty inches long; the wood specimen about forty inches long, three-fourths inch wide and three-eighths inch thick. A gas flame is applied to the lower quarter of the wood specimen for four minutes. To the balance arm is attached a pointer which indicates on a scale the percentage loss in weight as the burning proceeds. The temperature at the top of the tube is measured by a thermocouple type of pyrometer. As the wood is decomposed by the flame the coals that drop are caught in the bottom of the tube and their tendency to continue to glow is noted. A burning temperature of about 1,832 degrees at the base of the tube is obtained with a bunsen or gas burner, adjusted to give a blue flame about eleven inches in height. The wood specimen is suspended vertically with its lower end

about one inch above the top of the burner. A little more than ten inches or one-fourth of the wood specimen is subjected to temperatures of between 1,700 and 1,850 degrees and the upper half to temperatures of 375 to 500 degrees.

The wood specimen is thus exposed to temperatures ranging from those existing under severe fire conditions down to the approximate ignition temperature of wood. Under these conditions untreated wood ignites quickly, flames spread along the entire length of the stick which loses weight rapidly, and temperatures of 1,350 to 1,500 degrees are built up at the top of the tube within three or four minutes. But a specimen of fire-treated wood ignites with great difficulty, if at all, its lower end chars slowly, it does not spread flame or burn beyond the igniting point and causes little increase of temperature at the top of the tube.

The test shows that by means of proper impregnation by fire-resistant chemicals wood can be used widely in fireproof construction. The fire-tube test is being supplemented by fire performance tests upon built-up assemblies. For the build-up test technicians of the Forest Products Laboratory have developed iron-inclosed air-ventilated gas burners equipped with thermocouples placed at intervals of six inches to three feet throughout the structure being tested. An entire door, window sill, or wall or floor panel is placed in the oven, and maximum ignition temperatures are applied to its various parts for long intervals, sometimes as much as four hours at a time. Records are kept of loss of weight, flame-spread, conductivity, and areas of combustion. Entire doors or structural panels can be fire-treated to a point where there is no flame spread and where loss in original weight is as low as eighteen per cent.

From a building standpoint it is now possible to make a building largely fireproof by using as little as ten per cent of fire-treated timbers at various points where fire is most likely to break out, sills, eaves, inner walls, stove or furnace bases, electrical connectors, etc. Plywoods and fiberboarding are being manufactured which are more fireproof than asbestos. A great deal of study is being given to fireproof roofing.



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Hunting Treasure

(Continued from page 205)

able mercury-vapor lamp like the ones used for artificial "sun" baths, or even from an electric arc flaming between iron electrodes, you can detect instantly any of the hundred or more minerals possessing this property. Under the black-light radiation, livid streaks on the rocky walls will betray pay ore. Miners in several



Putting spectrum film into analyzing device for microscopic study

tungsten mines near Randsburg, Calif., use the argon bulb or the iron arc to outline the veins, since the ore looks no different from barren rock to the human eye. They also find it a help in sorting broken rock and picking ore from worthless rock. It's a quick method of prospecting for certain metals, and makes it worth while to stroll through abandoned shafts and flash the black light upon the walls.

Another trick is to turn a blowtorch upon the rock and examine rising vapors by shining the black light through it. A fluoroscope like that your doctor uses when he studies your chest with the X-ray, gleams a weird green under the black light; but if cinnabar is present, mercury vaporized out of the rock will cast a dark shadow on the screen.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

Forecasting the Weather

(Continued from page 213)

whether the forecasts are for fair or dull weather.

Air-mass analysis got its start when it was learned that large portions of the earth's atmosphere, covering as much as several million square miles and extending to heights of six or seven miles, have rather uniform characteristics. Usually an air mass from the polar regions is extremely cold and dry while an air mass moving up from the tropics is warm and humid. These air masses frequently collide and the dissimilarity of the air in the two masses results in atmospheric disturbances along the boundaries that separate them. Cold air is heavier than warm moist air, so the polar air mass begins to slope in under the warm mass, pushing its outer fringe upward. This slope between the cold and warm air is usually at the ratio of one to 100, so that if one were standing in cold air 100 miles from the line where cold air is meeting warm air at the surface, he would find warm air one mile above him.

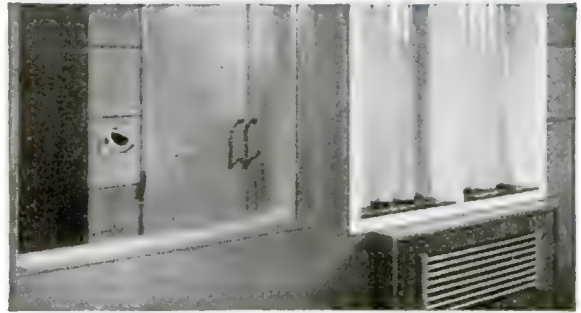
There is a continual struggle going on between these polar and tropical air masses or currents. The usual result of each meeting of two different masses is clouds of precipitation, caused by the boosting upward of the warm air to altitudes where the moisture starts to condense.

This is a rough rule-of-thumb outline of the air-mass system. To accurately gauge the weather by it, forecasters have to assemble on charts, hundreds of reports coming in by radio and telegraph from airplanes, ships and ground weather stations. Each air mass is different, but on the charts the migrations of the masses may be plotted several days ahead of the time that they reach a district, and in that way the probable weather disturbances and their probable times of arrival are anticipated.

"Climate is merely a summation of weather, and weather from day to day results from disturbances along the atmospheric fronts," says Dr. Krick. "This gives us a start in attempting seasonal weather forecasts, for if the semi-permanent atmospheric fronts during the seasons of

(Continued to page 126A)

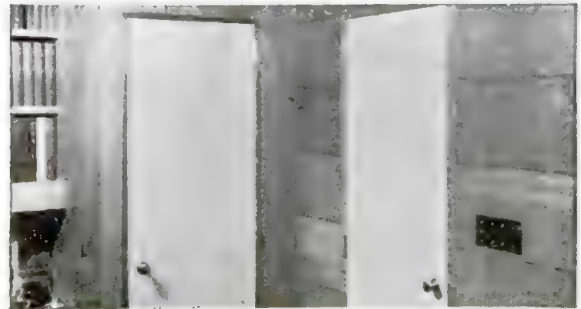
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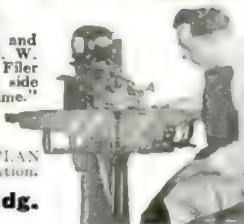
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(Continued from page 125A)

the year can be anticipated the kinds of weather associated with them may be determined, and thus the climate of the region.

"Although the climate of the earth is not changing appreciably over long periods of time, certain departures from the so-called normal weather occur from year to year, such as the floods in the Ohio valley and the frosts in southern California that happened last winter. These developments are explained and in fact were anticipated by a shift in the semi-permanent fronts that were observed in the spring of 1936.

"When the causes of such shifts in the principal atmospheric boundaries can be determined we shall be able to anticipate long in advance the abnormalities that result in seasonal weather. Then these predictions should be just as accurate as the present forecasts of the day-to-day changes in the weather."

Big Terrestrial Globe Clock Has Lighted Numerals

Lights in the dial around a large terrestrial globe clock in a Boston building indicate the hours by large Roman numerals, and minutes by smaller Arabic numerals around the edge. Hanging in the foyer of the building, the clock is controlled by a Telechron motor, causing it to keep time in synchronization with alternating electric current. A twin celestial globe at the other end of the foyer indicates the day of the month.



*Christian Science
Monita Bldg
Boston Mass*

Caution! Danger Ahead!

(Continued from page 197)

tomobiles and more than one-third involved striking pedestrians. But don't pick off a pedestrian instead of a car if you must hit something. Hitting pedestrians caused nearly twice as many deaths last year as hitting other automobiles.

Since you're a pedestrian the minute you park your car, perhaps you can profit from the mistakes of last year's pedestrian victims. About twenty-eight per cent of them met death or injury while crossing between intersections, more than ten per cent while crossing at an intersection without a signal, and more than six per cent of those killed and thirteen per cent of those hurt were crossing at a corner



against the light. And nearly twenty per cent of those killed were walking on a rural highway. The lives of another eight per cent were snuffed out as they came from behind parked cars, and this foolish practice also accounted for more than eleven per cent of the pedestrians injured by automobiles.

"Something was wrong with my car," says the driver after a smash-up. Perhaps, but the 1936 accident figures indicate that the chances are that something was wrong with the driver. More than ninety per cent of cars involved in accidents last year were in apparently good condition. But poor brakes, glaring headlights and punctures or blowouts were the defects which resulted in the most deaths due to faulty cars. The lesson here is obvious—keep brakes, tires and lights in good condition.

Here's something else to ponder over. About eighty-five per cent of fatal and non-fatal accidents last year occurred in

(Continued to page 128A)

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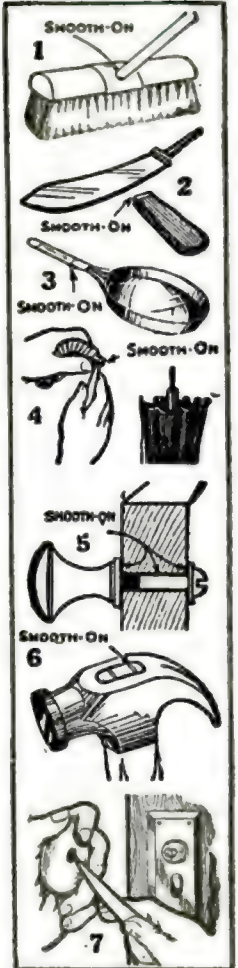
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By doing your own household and automobile repairing with Smooth-On No. 1 all the Smooth-On repairs you make in a year will probably cost you less than any one of them made by a professional mechanic—and you will be surprised at the ease of application and the number of places where Smooth-On can save money.

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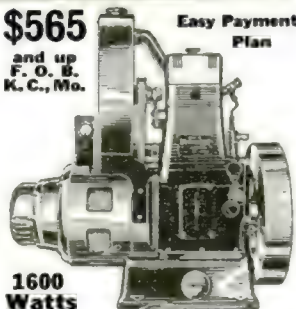
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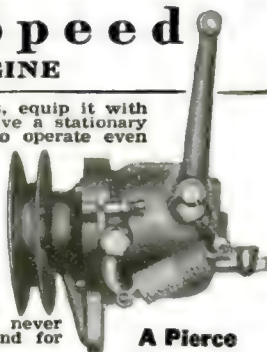
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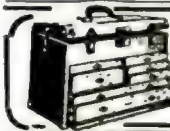


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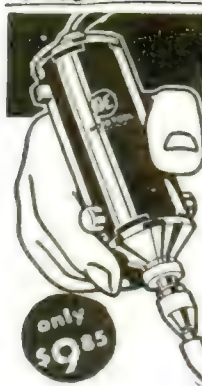
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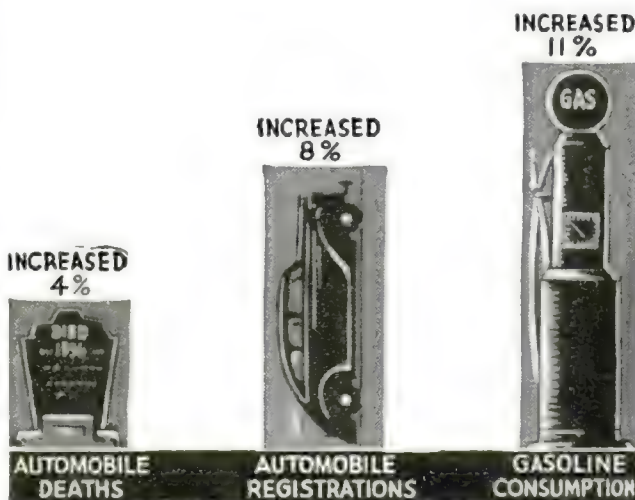
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\$9.85

(Continued from page 127A)

clear weather—no fog, rain or snow to blame the accidents on—and about seventy-five per cent of the fatalities and injuries occurred on dry roads. A clear day and a dry road spell speed. But for more than 25,000 people last year, the combination spelled death, partly because too many drivers went too fast for conditions—even on a good road and a clear day.

And here's something else to think about next time you decide to let 'er out on a straight stretch. Since 1924 fatal accidents in cities of over 10,000 population have increased twenty-six per cent. That's bad



This chart shows how motor-vehicle deaths, registrations and fuel consumption increased in 1936 over 1935

enough but here's the rub. Deaths on the open road, including towns under 10,000, have increased 165 per cent in the same period. Here again, speed is an important factor—too fast for conditions. At sixty you're going almost ninety feet a second—and it takes part of that second for you to move your foot from accelerator to brake after you decide to do so.

All these figures scream just one grim warning—be careful or be killed. To err is human, and every driver occasionally does the wrong thing at the wrong time. But if you make good driving practices a habit, your mistakes will be fewer—and the figures indicate that you'll probably live longer.

The traffic picture for the future is not all black, fortunately. On a basis of gasoline consumption, fewer persons were killed in 1936 than in 1935. Also eighteen states and many large cities actually reduced traffic fatalities last year. And

20 3 38
 twenty states with drivers' license laws had only a one-per-cent increase in traffic deaths, while states without such laws had an increase of about seven per cent. Modern highway illumination also has decreased night accidents virtually everywhere it has been attempted.

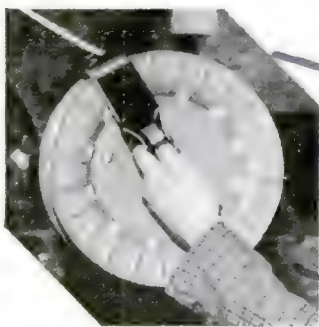
But all this has not been enough. More cars are being driven more miles each year and more people are being killed and injured despite everything that has been accomplished through advanced highway engineering, legislation, education, enforcement and other safety measures. The ultimate solution of this problem rests with you—you and 40,000,000 other drivers, some a little worse, some a little better, but most of them surprisingly like you.

And you, the figures show, are gambling your life and the lives of others when you take a chance in traffic today. If you buy a sweepstakes ticket, you hardly expect to win. But you might. When you take a chance in traffic, you never expect to lose. But you might—for you are eleven times as likely to be killed or injured in an automobile accident this year as the holder of a sweepstakes ticket is to win even a small prize. In one case, you're gambling a few dollars, in the other you're gambling your life—or the life of your victim.

Is the gamble worth the risk?

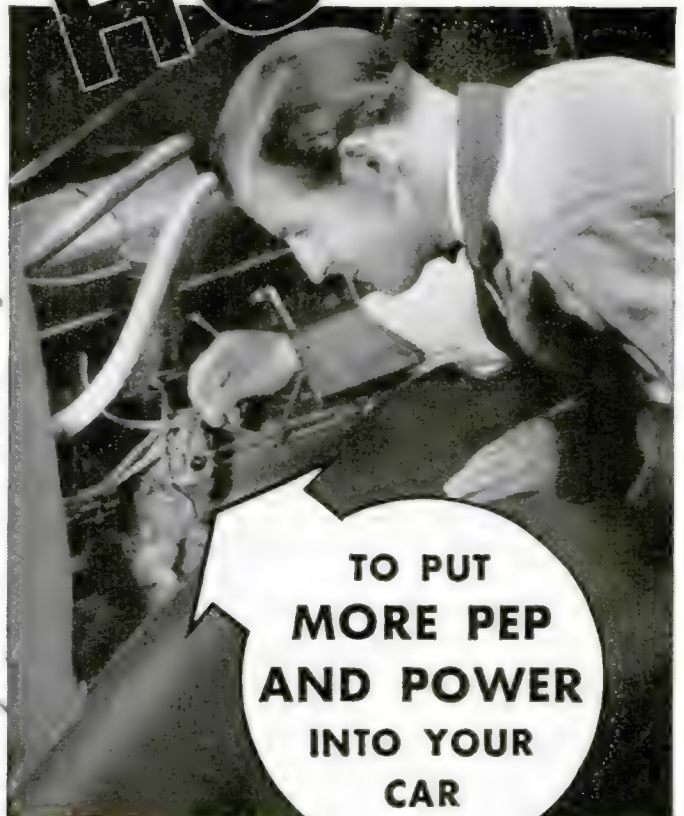
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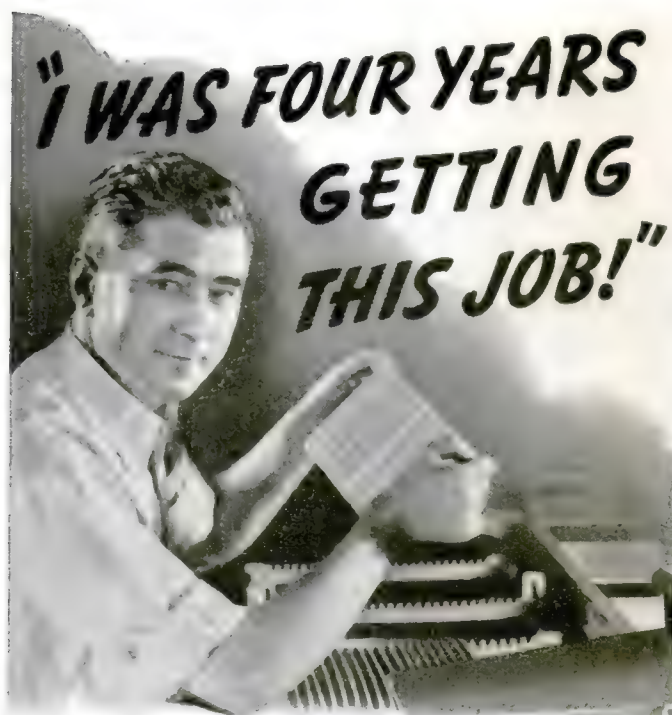
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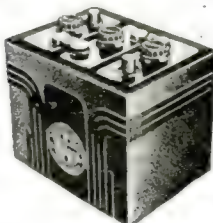
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COST LESS TO OWN!

Because they last longer...
crank faster... don't let you down

Super-Steam

(Continued from page 238)

country—laboring eight hours a day every day in the year.

Super-steam has made it cheaper, in general, to buy coal to produce a kilowatt near the place where the power is to be used than to produce that kilowatt by distant water power and then transport it. It is even cheaper to burn coal and get clean steam than to use free steam if the free steam is dirty. North of San Francisco it is possible to get steam under pressure from the earth by sinking pipes about seventy-five feet. But this steam contains chemicals, necessitating the construction of special turbines. So, even with free steam, in this case, it has been found more practical to burn fuel to obtain steam than to use what nature offered.

But there's more to making electricity from steam than just fuel. For every ton of coal that goes in the furnace, about ten tons of water must be supplied to the boiler, twelve tons of air must be sucked into the combustion chamber and up the stack go thirteen tons of combustion gases. In addition, a tremendous amount of water must be used to cool the steam in the condenser. One New York power station daily pumps 3,600,000 tons of river water through its condensers, more than the daily water supply of New York City. And ten power stations along the East river use so much water for cooling that the average temperature of the river has been raised sixteen degrees in thirty-six years. That's one river that will never freeze again.

The turbine plant utilizes even the heat in the tons of flue gases. Air intended for the combustion chamber is passed through pipes in the flue and thus preheated and water going to the boiler also is preheated by these same gases because, the hotter the air and water, the quicker the generation of steam.

No one knows the life of a steam turbine because they haven't been making them long enough to wear them out. Since it has only rotary motion, wear is minimized. The expensive parts of a turbine don't wear out and the buckets or other minor parts that do need replacement are not expensive. Seldom does a good tur-

(Continued to page 133A)

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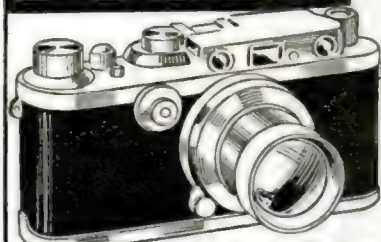
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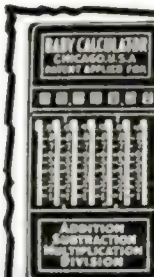


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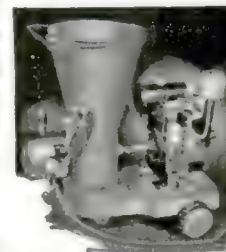


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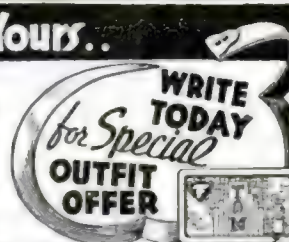
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(Continued from page 130A)

bine lose as much as one per cent in efficiency over a period of years.

The turbine originally was a vertical plant. Now they are horizontal. As turbines grew in size, one bearing resting on the ground was forced to support tons of rapidly rotating parts. It also was found that the structure of a big vertical turbine could not be made sufficiently rigid. Now they are laid on their sides and the shafts have more bearings.

All turbines are not put at work driving generators to produce electricity. Some are directly connected to the machines they operate. Others are geared down to drive slow-speed generators or other comparatively slow-speed machinery, such as the propellers of a ship. Nor do all turbines exhaust into condensers. In cases where heat is needed, the steam first goes to the turbine and makes electricity or mechanical power, then the exhaust steam is employed for heating purposes. In this way the steam is made to serve double duty.

The bleeder or extraction turbine is a combination of the condensing and non-condensing types. Part of the steam goes to the condenser but part is piped away for heating, baking, drying, cooking and other industrial processes. A mixed pressure turbine has a condenser but operates opposite to a bleeder turbine. Instead of extracting fairly low-pressure steam for heating purposes, low-pressure exhaust steam from engines and pumps is admitted into the turbine shell. Here again some of the steam is used twice, perhaps for operating a steam pump, after which the exhaust steam goes into the turbine at low pressure and makes more energy, mostly below atmospheric pressure.

In 1919, the average public-utility generating plant burned more than three pounds of coal per kilowatt-hour. In 1936 the average fuel consumption per kilowatt-hour was less than half that and the best turbines were producing a kilowatt-hour with three-fourths of a pound of coal. Part of this has been due to the higher pressure and temperature of the steam, part to the higher vacuum and greater capacity of the condensers. More push applied at one end, more pull exerted at the other!

(Continued to page 134A)



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(Continued from page 133A)

In 1919 there were about 10,000,000 buyers of electricity in this country and the average rate was about eight cents per kilowatt-hour. Last year there were 26,000,000 customers and their average rate was 4.7 cents per kilowatt-hour. Since 1920, the energy used by industrial plants has increased nearly two and one-half times while the price has decreased more than thirty-five per cent while domestic energy used has increased more than five times and the price has dropped more than thirty-seven per cent.

More electricity sold to more customers for less money—cheaper power. That is progress—progress with an engineering background, progress due in large measure to the development of more push and more pull in steam. George Washington could travel no faster than Alexander the Great. Cheap power enables us to outstrip both for the mass production of automobiles, for example, at a price within the means of millions would be impossible without electric power.

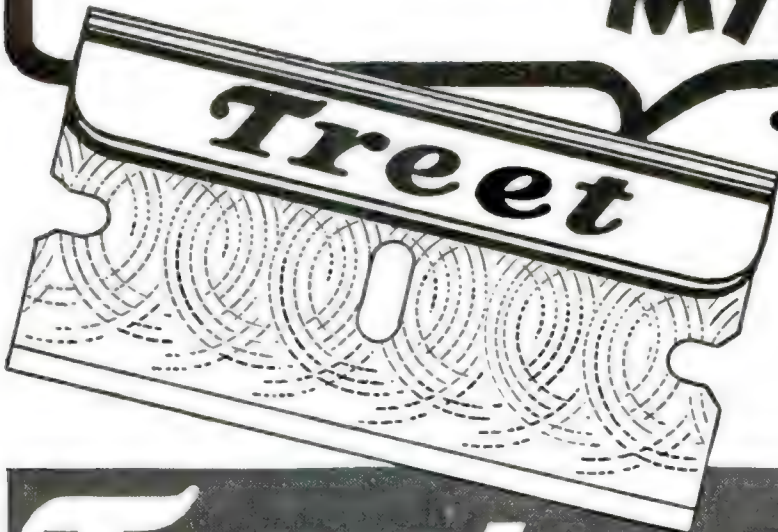
And we may expect greater power triumphs in the future—still cheaper power. The story of steam thus far has been primarily a story of steam from water, but today engineers are experimenting with other liquids which boil at other temperatures. In boilers at the General Electric company at Schenectady, N. Y., are 155 tons of mercury, costing about \$300,000 and used over and over again instead of water in the boiler and condenser. Mercury is boiled at 958 degrees and 125 pounds gauge pressure. The vapor first is used to turn a mercury turbine, then it exhausts into the condenser-boiler where its heat evaporates water to steam, and the steam drives still another turbine.

While man has been able to convert more and more of the energy in steam into useful power, he still is challenged by a dream—the dream of converting all the energy in a pound of steam into electricity. Today he wastes about two-thirds of that energy. But, even so, he has found it practical to buy coal and make a kilowatt with steam, rather than transport a kilowatt made by hydroelectric power plants over a long distance.

The imagination of turbine engineers visions a day when a turbine will produce

(Continued to page 136A)

"YOU'LL LIKE MY TOUCH!"



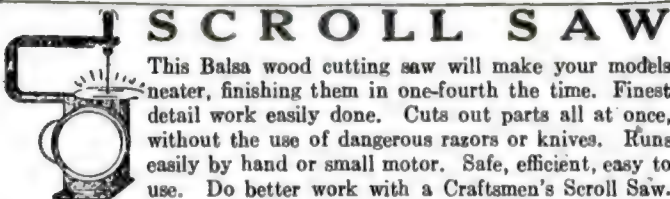
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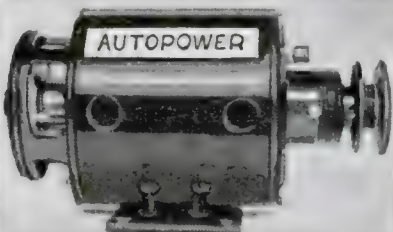
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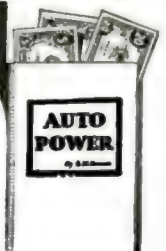


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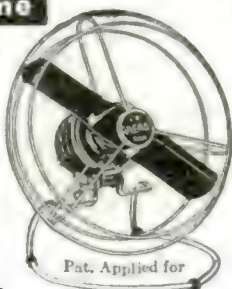
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(Continued from page 134A)

a kilowatt-hour from eight ounces of coal instead of twelve ounces—half a pound instead of three-fourths of a pound. That saving of four ounces of coal would send virtually every steam turbine in use today to the scrap heap. But it would do more than make a market for more efficient steam-power machines.

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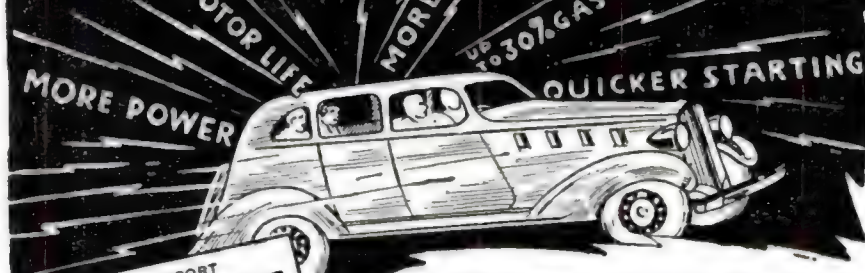


Fitting tester over lens and reading dial showing condition of headlamp

test is made by placing the open end of the device to the lens of the headlamp and reading the dial to find volume and intensity.

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The VACU-MATIC Co. Wauwatosa, Wis.

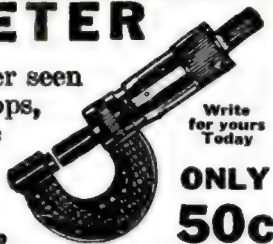
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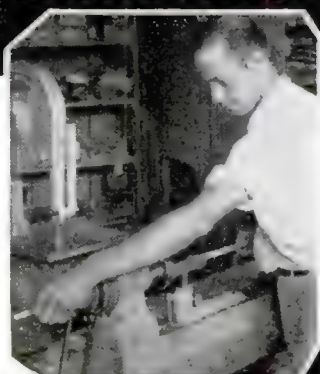
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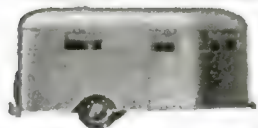
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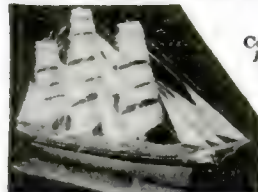


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Celluloid Models

(Continued from page 183)

models look as if they had been carved from crystal or molded in glass. This impresses the prospective customer, and enables him to grasp more details of the internal structure in an instant than he could obtain by studying drawings for hours. When, as a result of deflection studies or other tests, it is found that something is not as it should be, changes can be made in the celluloid model, or a new model can be built, and the trouble remedied at comparatively low cost.

It is this item of cost that makes the models so valuable. The money spent for a single model might buy a sixteen-cylinder automobile; but the model may save enough to pay for several hundred such cars. When an engineer can solve, with inexpensive celluloid, problems that might make it necessary to scrap an entire full-scale machine if they went unsolved, there is definitely a saving of real money.

Westinghouse engineers have used some of their models to study actual operation of parts. A celluloid replica of a propeller-type blower is a typical example. They operated it at a speed of 6,000 revolutions per minute, and made a complete set of efficiency studies. That is, they determined the capacity, rate of flow of air through it, and other characteristics as accurately as if they had been working with a full-sized machine. In a similar manner, they have studied the flow of steam in turbines.

Celluloid miniatures are, for all practical purposes, permanent. They withstand rough handling, and can be shipped about the country or stored indefinitely. Their worst enemy is an open flame.

The fascination that surrounds the construction of models in wood or metal is not lost when the builder works with celluloid. In several respects, celluloid is easier to manipulate than most other model materials. The methods employed in industrial laboratories ought to be of interest to every home mechanic, tinkerer, engineer and other person who likes to build models, or other things. There is no reason why the process of constructing a celluloid steam turbine could not be employed for a jewel box, candy jar or crumb scraper. A typical case of domestic use of

Electric & Mfg. Co. East Pittsburgh

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the celluloid method occurred when it was necessary to provide a waterproof, rugged label for a shaving-lotion bottle. The words "Shaving Lotion" were printed on a piece of typewriter paper, with india ink. The paper was cut into a strip, wrapped around the neck of a bottle originally intended for holding bitters, and a slightly larger strip of celluloid laid over it, its ends meeting in a butt joint. While rubber bands held the celluloid in place, acetone was applied to the seam. Within a few minutes the bottle was ready to use, its label protected by a tight collar of transparent celluloid.

The production of models accurate to scale requires trained fingers. In the laboratory, the most skilled mechanics usually are put to work on such projects. After a little time, the model builders acquire remarkable skill, and become capable of turning out work that is clean and precise.

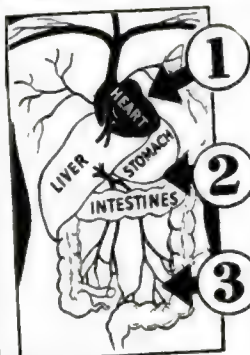
Celluloid is available in a variety of forms and appearances. For machinery models, transparent sheet stock of various thicknesses is used. Some of this stock, in the thicker sizes, contains tiny air bubbles, but these usually are not objectionable. Modern celluloid is not as inflammable as many persons believe. You can touch the end of a lighted cigarette to the edge of a sheet, and the celluloid will melt and give off smokelike fumes, but it will not burst into flame. Very thin shavings might be ignited in this way. An open flame will ignite celluloid, but it burns relatively slowly, and not with explosive force.

Celluloid parts for models are cut with a knife or jig saw. With a knife and straightedge, thicknesses up to one-eighth inch can be cut easily. The celluloid first is scored with the knife, and then bent until it breaks along the line. Pieces are fastened together as soon as possible after they are cut, because celluloid absorbs moisture and changes its shape.

The "welding" of celluloid pieces is perhaps the simplest imaginable way of fastening things together. The pieces to be united are moistened with acetone, held in contact for several seconds—and the weld is complete. Acetone is a clear, volatile, waterlike liquid used widely as a solvent for organic compounds. When the model-building engineers first started us-

(Continued to page 140A)

NEW 3-WAY TREATMENT HAS PUT ON SOLID POUNDS FOR THOUSANDS OF SKINNY PEOPLE



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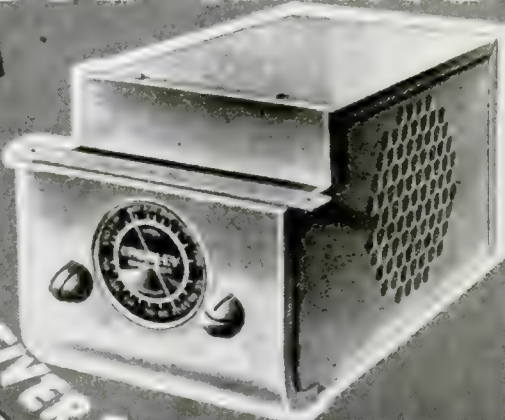
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STOP the GLARE

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(Continued from page 139A)

ing celluloid, they applied the acetone with medicine droppers. But they soon discovered that this produces unsightly joints because, wherever the acetone runs out over the celluloid surface, it leaves a mark. So they adopted hypodermic needles as standard acetone applicators. With such a needle, a skilled model builder can make a joint that is perfect. When two pieces of celluloid are in close contact, application of acetone at one point causes wetting of the entire joint, because it is drawn between the pieces by capillary action. The surfaces must be free of grease if perfect welds are expected.

Smoothing projecting edges, rough spots and sharp edges can be done with a fine-toothed file, a sharp knife, or a small plane having a sharp bit. Another tool that has been found useful is a rotary file, a gadget that resembles a dentist's drill but is larger. It is driven by a flexible shaft attached to a motor.

Celluloid sheets to be used for curved parts are bent after being made pliable by immersion in water at 170 degrees Fahrenheit. When they cool, they retain their shape. Tests have shown that sheet celluloid resembles wood in that it is stronger in one direction than the other, probably a result of the rolling operation during manufacture.

After a celluloid model has been assembled, it requires no further finishing.

The use of models of turbines and other machines for studies of efficiency, deflection of parts, operation, design and the like as carried out at the Westinghouse laboratory is distinguished from the use of similar material in polarized light studies of sections of beams, girders, etc. The polarized method, much older in point of the years it has been used than the celluloid model building, indicates the distribution of stresses in the model part. Thus polarized light, passed through a cut-out model of an I-beam under load and focused on the ground glass of a camera, will show the lines of stress in two of the three dimensions. Polarized light is not used by Westinghouse engineers in their tests on celluloid models.

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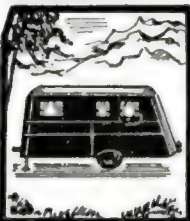
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We Want 100 CAR OWNERS to Accept a Complete Set of



Pedrick
HYDRAULIC
PISTON RINGS

If your car is an "oil burner" and a glutton for gas—lacks speed and power—grab this OPPORTUNITY!

It's no fun driving a sluggish automobile that won't respond when you step on it—and it's dangerous, too! We want you and other car owners to know by actual experience that Hydraulic Piston Rings positively will restore original power and pep, even though your car is old and worn. That's why we are giving away 100 sets of Pedrick Hydraulics (cash value \$6.80 to \$17.20) in the next 30 days as part of our "Tough Job Test" campaign. If you want a set of these remarkable rings for your car, clip and mail coupon today—now—and get full information.

WE WANT "TOUGH" JOBS

THE TOUGHER THE BETTER

To demonstrate the sensational results obtainable with Hydraulics—prove our claims for outstanding superiority, we are making these "Tough Job Tests." We want to show car owners that they do stop oil pumping and power loss under adverse conditions. That's why we are offering a hundred sets of rings—something no other manufacturer has ever done, to our knowledge.

Old, Worn Motors Actually Made to Perform Like New!

Almost unbelievable, the difference that Pedrick Hydraulics make. Imagine a car with 50,000 miles on it sipping away like a flash when the lights change, and climbing steep hills in high. That's what Hydraulic Reconditioning does! And, oil loss and gas waste are eliminated, too—saving from \$25.00 to \$100.00 a year in operating expense.

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Only patented Hydraulic Action uses oil pressure, instead of stiff expander rings, to effect a positive oil and power seal. Therefore, don't expect Hydraulic results with any rings except genuine Pedrick Hydraulics—because only Hydraulics can effect a positive, yet flexible seal in tapered and out-of-round cylinders.



A—UPPER RING SECTION
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LASTING RESULTS

Hydraulic Rings assure new car performance for thousands of extra miles. The ring pressure varies automatically with speed of engine—light when idling—heavy when speeding—result—no abnormal wear on rings or cylinder walls.

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When writing please mention Popular Mechanics

Salvage Squad to the Rescue

(Continued from page 221)

to get it out of there with pumps and hydraulic siphons.

Salvage men respond to alarms in their own special trucks. In the central fire district of Los Angeles where Capt. Lesinsky and the six other men of Salvage Company No. 24 answer about seventy alarms per month and save as much as \$1,000,000 worth of property every year, the truck



Salvage man catching water from chandelier hole as it drains off tarpaulin

hauls a heavy load of special salvage equipment. Most important are the sixty-five salvage covers, each of which measures twelve by eighteen feet and weighs thirty pounds. The truck carries two roof covers to protect during rainy weather holes burned in roofs. Once this salvage squad saved \$75,000 worth of clothing from damage even though no fire occurred. During a heavy rainstorm the roof drains of a building became clogged and water started to pour down through the skylights. An alarm brought the salvage company and some of the men covered valuable stock while others went up on the roof to free the drains.

The salvage truck also carries shovels and buckets, mops, brooms, sponges and chamois, and plenty of sawdust. Sawdust

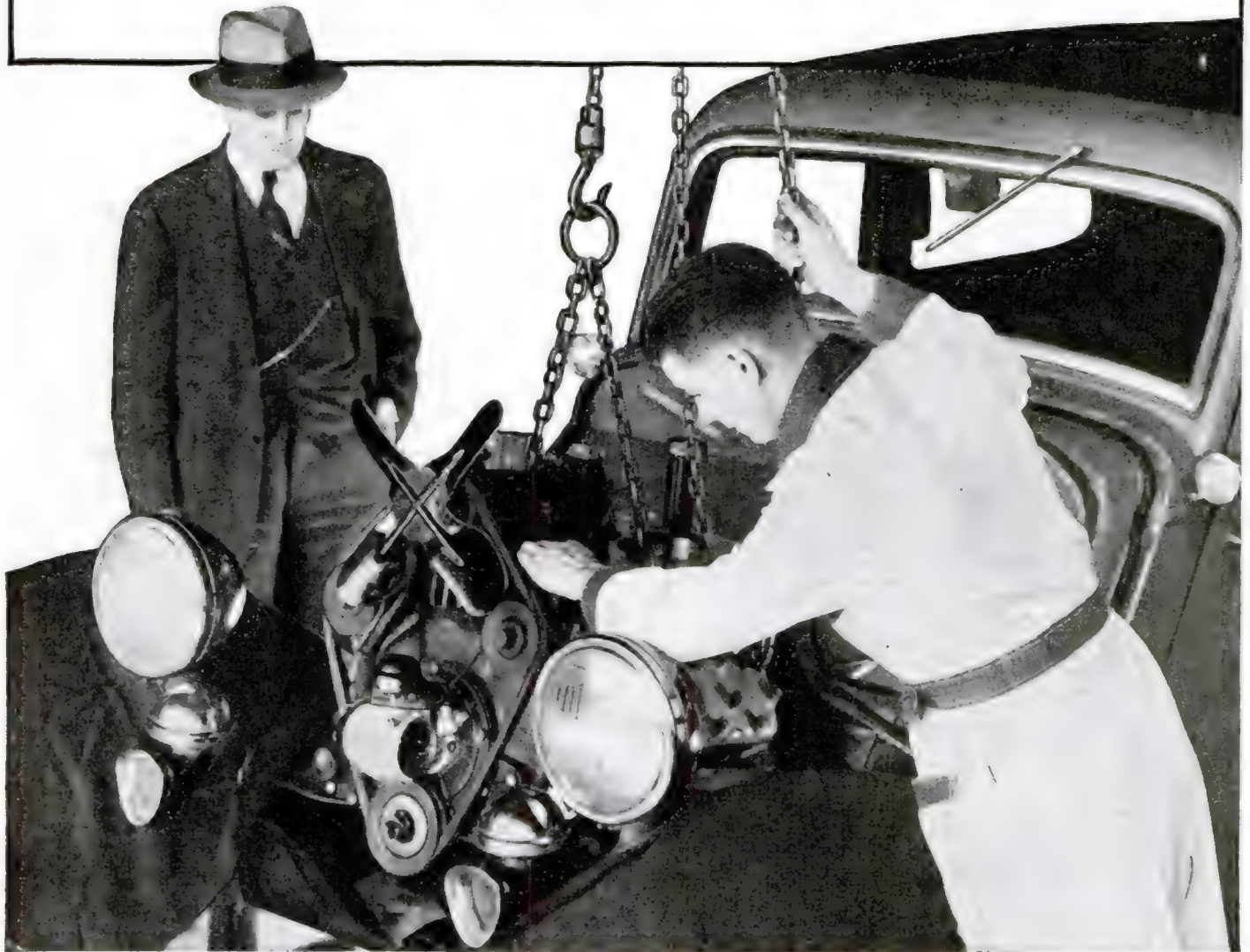
is one of the best tools that salvage men have. Sprinkled on a floor, it absorbs great quantities of water and keeps it from spreading. Two rows of sawdust make a practical channel for getting rid of waste water. The salvage squad uses sponges and pieces of chamois for wiping off furniture and walls after a fire. Gas masks, forcible entry tools, and sprinkler head replacements are other equipment.

The first thing the salvage officer does after reaching a fire is to make a fast decision as to what should be protected first. In commercial establishments office records are always first since they could not be replaced. Office furniture and equipment are next. Electrical equipment and motors always get protection as soon as possible. Once Capt. Lesinsky asked the fire fighters to let a building keep burning. "Hold the water for just a couple of minutes," he begged. "That first floor is full of expensive watches and sporting goods. A little water will ruin everything." By that time the ceiling was on fire but Lesinsky and his men dashed in and laid their covers over the stock. The slight delay reduced total damage to only a fraction of what it might have been.

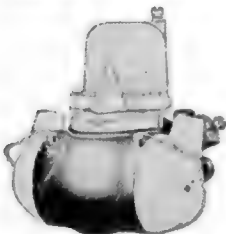
One of the times of which Lesinsky is especially proud occurred when a bakery caught fire. The building looked like a total loss to the owner when Lesinsky asked him when the next shift of bakers was due to report for work. They were due in three hours, the owner replied, and Lesinsky told him to have them go to work as usual. "You are crazy," the owner retorted. But Lesinsky's men had been on the job and when the fire was put out an hour later the astonished owner walked through the plant watching the salvage men pull covers from office machinery and furniture, uncover stacks of coconut and sugar and flour, and sponge off the equipment. The roof and one end of the building were a total loss but the early morning shift of bakers went to work on time, after the salvage squad had mopped the floors for them and swept up the debris.

That's the kind of work that salvage men are proud of. Their motto is: "Keep down the loss!"

Parts Exchange Plan Saves Money and Time for Ford Owners



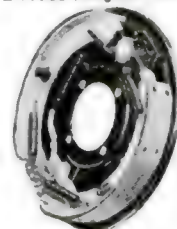
CLUTCH DISC ASSEMBLY—Hubs checked or replaced to insure correct fit. New clutch facings. Exchange price, \$1.75.



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BRAKE SHOE AND PLATE ASSEMBLY—For 1937 cars, completely rebuilt. Brake shoes relined. Exchange price, \$1.75. For models prior to 1937, reconditioned and relined brake shoes. Exchange price, 45c each.

THE Ford Engine and Parts Exchange Plan offers Ford owners the modern, economical way to recondition their cars after thousands of miles of service. It eliminates old fashioned overhauls. It saves time. It saves money. And it enables Ford owners to maintain Ford quality and performance throughout the life of their cars.

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Their six-fold action benefits every vital organ in your dog's body. You'll never know how fine your dog can be until you have tried them. Ask for **Rex Hunters Condition Powders—Keep Dogs Fit.**

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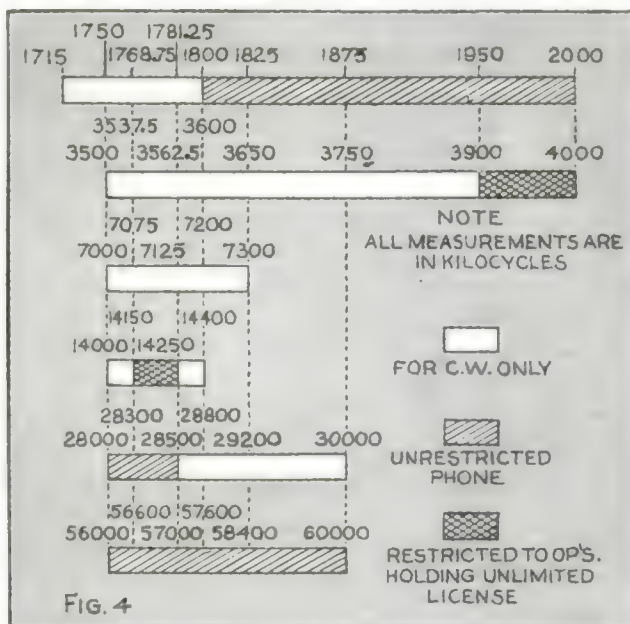
FREE CATALOG

"Cold Oven" Crystal Holders

(Continued from page 260)

base; countersunk holes are drilled and tapped in the Bakelite block to take four machine screws that are passed through holes drilled in the copper block. The Bakelite top cover is held by means of four machine screws that go down through holes drilled and tapped through each corner of the copper block.

When preparing the brass top plates for either of these holders, the surface placed next to the crystal, and the top surface of the copper where it contacts the crystal, should be ground flat and smoothed by using No. 120 carborundum on a piece of glass. Spring-brass contacts are bent to hold the crystals and brass top plates in the multiple unit; these contacts are



drilled for binding posts mounted on the Bakelite cover, thus completing separate electrical connections to each crystal. Mounting plugs are tapped into the copper base. One of these plugs, of course, makes the common bottom-plate circuit connection.

Some experimenters purchase crystal-plate blanks and do the final grinding and calibrating themselves, others cut original blanks from the solid piece of quartz. The plate is cut from the solid crystal in such a manner that its electrical axis is at right angles to the optical axis. The first cuts are illustrated at A and B in Fig. 2; a plate, "or slice," is then cut from the prism in a direction perpendicular to any of the parallel faces. A chart showing all amateur bands appears in Fig. 4.

Gold Rush of the Experts

(Continued from page 163)

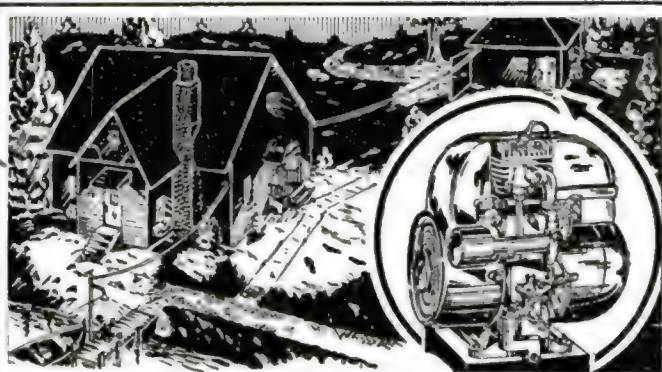
finders, and willow rods, have been introduced to the world as sure-shot methods for locating gold and other precious metals. Most of these devices have been debunked by experienced mining men. However, the experts are now giving careful study and some of them have already given approval to several gold-locating instruments which have been perfected by Charles A. Isham, a mining engineer, and his son, Buford.

One of the Isham instruments, known as the earth resistivity method, forces electrical currents into the ground. Oscillating needles on the delicate mechanism point to the amount of resistance as the current enters the earth. When it strikes a mineralized zone, the zone's size and depth can be determined mathematically, as the resistance is less when it enters an ore body. Another unit is used to relocate lost veins. This set can be used in a tunnel and it can determine within a few inches how far an ore body is from the surface.

The latter apparatus operates on a set of ultra-short radio waves. Its waves are directed into the earth like a searchlight beam, or a directional antenna. Three units are used—a directional coil that shoots out the electromagnetic waves, a mixing unit that picks up the vibrations generated by the contact of the waves with the ore body, and the receiver. The extent of the ore body is determined by moving the finding coil over the surface. When it leaves the point above the ore body the sounds cease and thus the operator is able to determine almost the exact location of the pay dirt.

Still another contrivance for the modern miner is the "doodle bug" dredger. It is not as complex as some of the others, and is really a product of the depression, but it gives to the placer miner a machine costing from \$30,000 to \$40,000 to replace the bucket dredges of the old days, that required an investment of from \$300,000 to \$400,000. Rapid changing of road-building methods and the depression caught road-building contractors with a lot of obsolete road-building machinery. The gadgets were used to construct a trial dredger on a barge about thirty by forty feet in area,

(Continued to page 148A)



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Each ONAN PLANT is a complete Unit, ready to run. No battery used except to start the engine. Easy to install. Available from stock. 32 volt, Direct Current Models also available. Write for details.

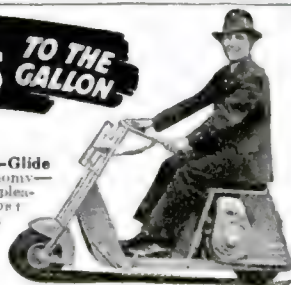
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120 Miles TO THE GALLON Auto-Glide

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DEALERS: Many selling 5 to 10 a week. Get SPECIAL OFFER!
THE CUSHMAN MOTOR WORKS, Dept. 66 Lincoln, Nebr.

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Powerful—Accurate—Economical—Practical—Adjustable Shooting Force—Amazing Maximum Velocity—cal. 177 or 22 and BB—For Target and Small Game—the only Genuine Compressed Air Pistol on the market—Single Shot with Bolt Action—Hammer Fire—Hair Trigger—Safety. Price \$7.50. Also 177 and 22 Single Shot Air Rifles \$7.50—Single Shot BB Air Rifle \$8.00—25 Shot BB Repeater Air Rifle \$7.50—at Dealer or Direct—No license required—Safe for indoor use.

FULL DETAILS—TARGETS—FREE—WRITE TODAY.
Benjamin Air Rifle Co., 631 N. Broadway, St. Louis, Mo.



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ELECTRIC OUTBOARD MOTOR

from old auto generator. We show you how. Variable Speed. Light weight and Silent. Operates from 8 to 12 hours on ordinary storage battery. Dime brings complete

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VIBRO automatic SHAVER

The PERFECT Shaver WINDS Like a Clock

Rapid, motor-driven, pulsating action cuts beard at base of hair without pulling or scraping. Works equally well on tough and wiry, or light beards. Curved head gets into hollows; shaves upper lip perfectly. Vibratory motion gives skin a healthful, stimulating massage.

No Electricity Needed

Operates anywhere — at home, in camp, on boats, trains, trailer. No wires. Vibro is the only non-electric, automatic shaver made.



1. Detachable Head.

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Prefer its light, smooth action. Ideal for removal of hair from the armpits and limbs.

This shaver will amaze and delight you. Order now — while special, low, introductory price is in force. Satisfaction guaranteed.

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SEND NO MONEY! Fully GUARANTEED! Shipped complete with instructions, weld wire, carbons, solder, ready to operate. Order now! Pay postman only \$2.95 plus few cents postage. Use 10 days. MONEY BACK if not perfectly satisfied. Send TODAY.

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FLYING MODEL AIRPLANE KIT,

with moulded fuselage, wheel shoes

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Nothing else to buy, kit complete...

SHIP MODEL FITTINGS — Die-cast — box-

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16" Wingspan.

Only **\$230.00**

for all parts for

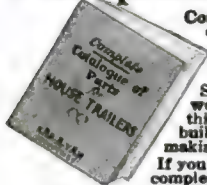
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KAR-A-VAN-A-INDUSTRIES, 2001 S. Michigan Ave. Chicago, Ill.

Gold Rush of the Experts

(Continued from page 147A)

and, reports say, mining men gave expression to unrestrained mirth. Miners are inclined to believe that the name "doodle bug" was applied derisively, when the mirth was at its height.

On the barge is mounted machinery for washing gravel. The equipment is somewhat similar to that used on the bucket dredges. It usually consists of a sixty-foot beam, a revolving trommel or screen, and steel riffles to catch the gold. A power shovel digs and dumps the dirt into the hopper above the trommel.

Until very recent days the quest for gold has been the haphazard undertaking of men in whom the urge for adventure and romance had been developed to extraordinary degree. Now science is taking a hand, and soon the production of the precious metal will be a precise undertaking.

Sponge-Rubber Fishing Lure Resembles Hellgrammite

Made of soft- sponge rubber, a new fishing lure for bass closely resembles the hellgrammite, which is considered excellent bait. Its construction results in lifelike action in the water and it is threaded on the hook like the genuine bait. The hellgrammite also is known as the dobson. Obtaining the live hellgrammite usually requires two persons, one to overturn rocks in the

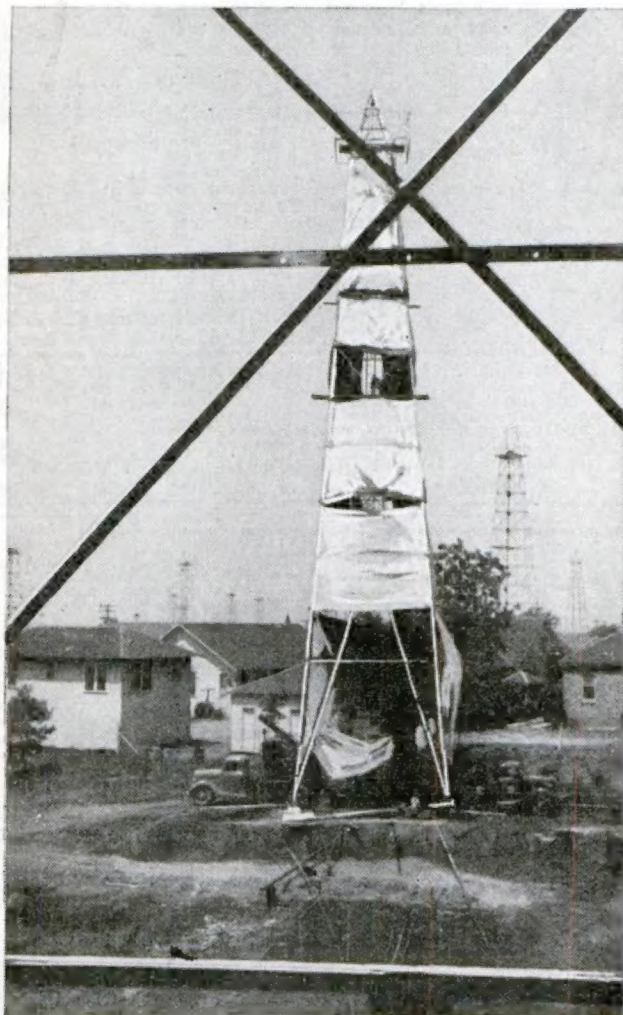


stream and the other to stretch a small mosquito net a few feet below. As the stones are rolled the current washes the hellgrammites down stream where they are caught in the netting. Care must be used in handling them because their front claws can inflict painful wounds.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

Carl Elton Stewart 30x
524 Longview Ave

Oil Derrick Dons Canvas Wrap During Housecleaning Time



When oil wells take a bath they wear canvas aprons to protect the neighbors from a spray of oil

Even oil derricks wear "aprons" in housecleaning season. Whenever it is necessary to pull out and clean the tube through which the oil flows, the derrick is covered with a canvas wrap to protect the neighbors. The pipe, sometimes a mile or more in length, is covered with oil inside and out, and a strong wind would blow this oil throughout the neighborhood and involve the oil producer in damage bills for repainting houses and replanting lawns and shrubs. While workmen clean the piping, two strips of canvas on the windward side are furled for ventilation.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information is kept on file and will be furnished by our Bureau of Information upon request, accompanied by stamped, self-addressed envelope.

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Just what you've been needing for garages, play houses, dog kennels, barns, milk sheds, trailers, outdoor signs, boats, truck bodies, greenhouses . . . a plywood that defies all kinds of weather and weather changes. Plies of Super-Harbord are fused together under heat and pressure and can't come apart. Binder is insoluble in water and proof against insects, fungi, all forms of rot. Big panels—easy to handle—quick to put in place. Ultra-smooth surface gives better paint finish.

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Gentlemen: Please tell me how Super-Harbord will give me better and cheaper outdoor construction.

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Plywood PLUS for outdoor use.

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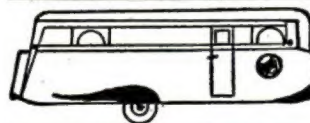
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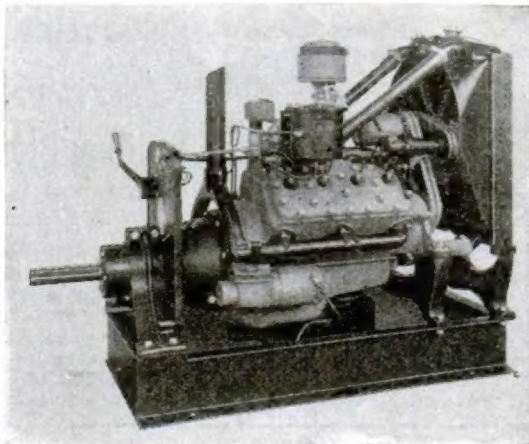
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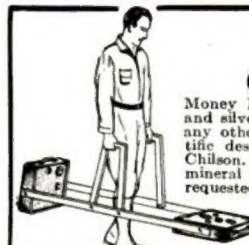
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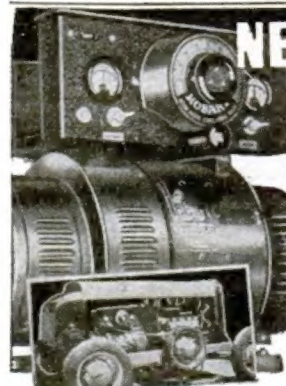
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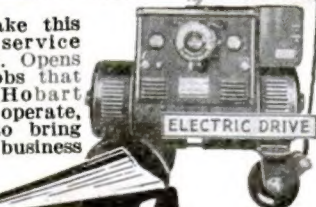
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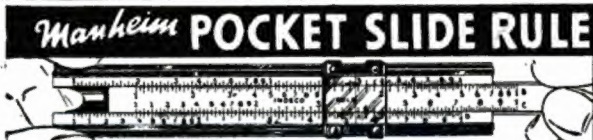
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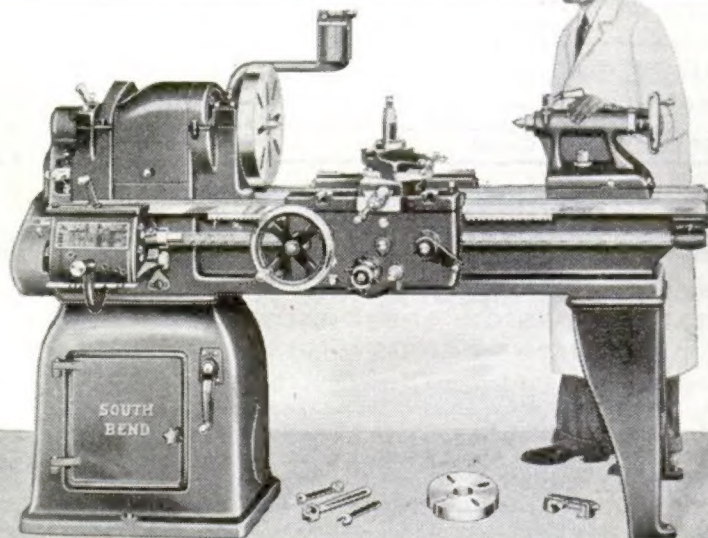
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